FEB 28 1944

FOOD INDUSTRIES

● FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION

Operator dumps egg meats into mixers in drying plant

FEBRUARY 1944

Feeding Europe After Victory

Use of Glass Pipe In Food Plants

Right Way To Vent Steam Retorts

Progress is Made In Shortenings

Frozen Fruits Improved in Tests

New Methods Used In Food Studies

How To Analyze Atmosphere in Cans

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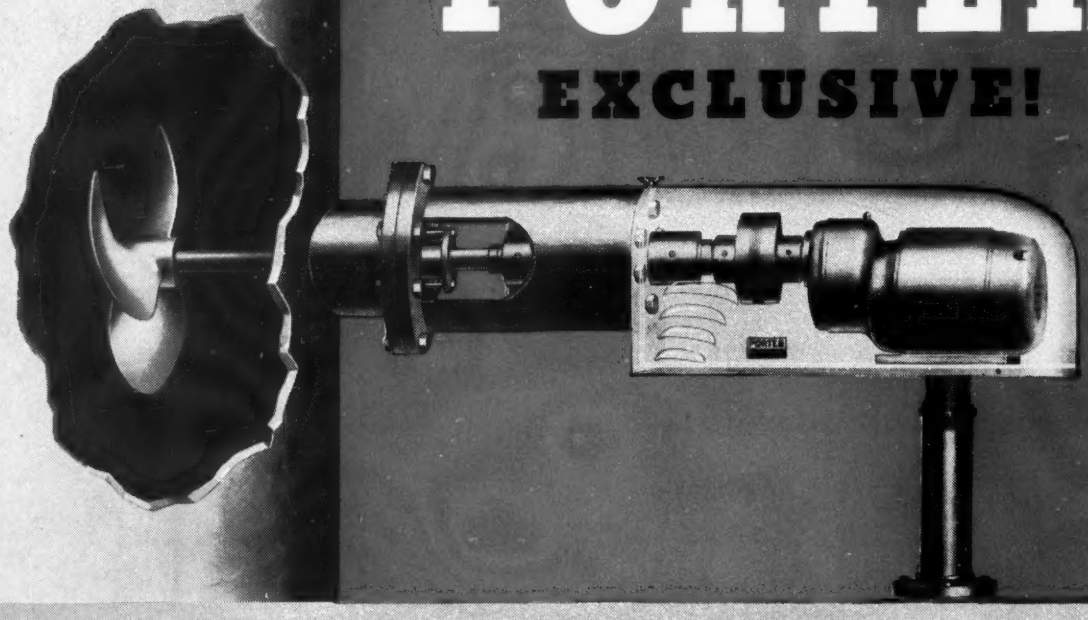

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THE COVER

Before whole eggs are dried to a powder for sale to food processors or for shipment abroad for military or Lend-Lease purposes, the egg meats must be thoroughly mixed. On the cover is shown a battery of stainless steel tanks, equipped with motor-driven agitators, which are used in this operation. *(USDA Photo by Forsythe)*

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Free Enterprise

. . . INCENTIVES AND TAXATION

There are three principal ways of making a living:

1. Getting on someone's payroll
2. Lending one's savings to business enterprises
3. Starting, or helping to start, a business enterprise

About three out of four of us fall in the first group—we are ***job-holders.*** Millions of us get some income, large or small, by lending our savings—directly or through such channels as insurance companies. We are suppliers of ***loan-capital.*** About one out of four of us has his own business enterprise, and several millions of us are part owners of business enterprises. Those of us who go into business for ourselves and those of us who are part owners of enterprises are ***job-givers.***

The amount of employment in a community depends, in the main, on the number of persons who attempt to make their living, or part of their living, by giving jobs to others, rather than by getting on someone's payroll. A community seriously desiring a high level of employment and a high standard of living will strive to make job-giving attractive and to encourage a large part of its population to be job-givers rather than merely job-holders.

The number of men who attempt to make their living in whole or in part by starting new businesses or by expanding old ones depends upon the outlook for profits. When the outlook for profits improves, thousands of new jobs open up and thousands of men go to work; and, as men go to work, the farmer and everybody else benefits. When the prospect for profits becomes darker, the demand for labor, capital, and raw materials drops. It may be roughly estimated that an improvement in the prospect for profits of one billion dollars raises the demand for labor by anywhere from two billion dollars to five billion dollars.

One of the principal determinants of the outlook for profits is the amount and the nature of taxes. After the war, the Federal government will need to raise each year about twenty billion dollars in taxes—three times the amount required before the war, and six times the amount re-

quired in the Twenties. In the Twenties, the tax needs of the Federal government were roughly twice as large as corporate profits in a good year. After the war, Federal revenue needs will be roughly three times corporate profits in a good year. Obviously, it will be much more difficult, after the war, for the government to meet its needs *without discouraging enterprise,* and therefore without diminishing the number of jobs, than it was before the war. Far more than ever before, it will be necessary for the government in developing a tax program to take account of the effect of taxes upon employment and the standard of living. This means that it will be important for each and every citizen to give attention to these matters—because the policies of the government reflect, in the main, the thinking of the citizens.

Some taxes seriously discourage individuals and business firms from undertaking new and enlarged operations. Other taxes have little or no adverse effect on investments. Some taxes are a burden on consumption, affecting the sales of specific commodities, depending on the nature of the taxes. It is obvious that different kinds of taxes have different economic influences. *We must understand the forces that determine the level of employment and consider the tax program in relation to other measures designed to create more jobs.*

What are the tests of a good tax system?

1. **Taxes should be designed to encourage production and enterprise and to make it attractive for a large number of people to earn all or part of their living by giving jobs to others.**

2. **Taxation must be fair in principle and administration, with no discrimination between persons in similar circumstances.**

3. **Taxes should be apparent and not concealed, and should be levied, in the main, directly upon individuals so that each of us will know how much our government is costing him. A moderate income tax at the lower income levels will bring a greater awareness of responsibility than will heavy taxes on consumption which the taxpayer does not see because they are hidden in the prices he pays.**

4. **In the aggregate, taxes should be somewhat progressive.**

5. **The tax system should be coordinated with the broader objectives of monetary and fiscal policy.**

6. **Federal, state, and local tax policies should be integrated as to principles and objectives.**

Judged by these standards, our present tax system is extremely unsatisfactory; in fact, it is actually damaging. It is a conglomeration of hidden and direct taxes and of conflicting taxing jurisdictions and policies, with no comprehensive economic motive. It is distorted to appease pressure groups and includes uneconomic punitive measures. It is full of needless complexities. It is a paradise for tax lawyers and a source of confusion and despair for the honest, enterprising business man. In fact, it would seem almost as if our tax laws had been written by some fifth columnist for the purpose of making private enterprise unworkable. We in America pretend to believe in the pioneer spirit, but no one would ever suspect it by looking at our tax system.

When the war is over, there must be a thorough reform of our entire tax system. Federal taxes can and should be reduced substantially; and, in the process of reduction, changes can more readily be introduced. At that time, steps can be taken to achieve some degree of coordination and unity of purpose among federal, state, and local taxing agencies. Taxes play too important a role in our total economic life to ignore the adverse consequences of unrelated and inconsistent policies of different taxing jurisdictions.

The following reform measures are needed in federal taxation:

1. **Repeal of the excess profits tax at the earliest possible date after inflationary dangers subside. In the case of most enterprises, the excess profits tax destroys all incentive to do a larger volume of business than in 1939; it appropriates virtually all increase in profits above the level of 1939.**

2. **Coordinate corporation and individual income taxes so as to avoid double taxation and impediments to risk-taking. Preferably, corporation income taxes should be wholly eliminated. Otherwise, the corporation tax rates should be reduced to the lowest effective rate on personal incomes. Full credit should be given to stockholders for all corporate income taxes paid.**

3. **Encourage competition and particularly the formation of new enterprises by allowing new corporations generous tax exemptions for a period of five years. Extend the same principle to unincorporated concerns.**

4. **Encourage risk-taking (and hence job-**

giving) through extending the loss carry-over to six years or more.

5. Provide for averaging incomes over a period of years in order to remove discrimination against those with irregular incomes and those who take risks of loss in business ventures.

6. Rely upon the personal income tax as the main source of revenue, with broad coverage. The reduction in total taxes after the war should favor the elimination of excise taxes before reducing income taxes.

7. Reduce the upper range of personal income tax rates to a maximum of perhaps fifty to sixty per cent so that risk-taking investments will be really attractive. Higher rates are punitive in character, yield small receipts, and throttle risk-taking.

8. Encourage risk-taking by individuals in the higher brackets by making the surtax on incomes of $20,000 a year or more half as much on income in the form of dividends as on income in the form of salaries or interest.

9. Encourage risk-taking by individuals by permitting capital losses to be charged against general income provided the reduction of tax liability in any one year is not more than fifty per cent.

10. Repeal the tax-exempt privilege for all *new* securities issued by all governmental jurisdictions.

11. Eliminate excise taxes which place a disproportionate burden on persons with lower incomes so as to encourage greater consumption and provide an expanded market for our vast industrial capacity.

12. Reform tax administration to simplify forms and procedures, to broaden the scope of enforcement, and to encourage the spirit of fairness.

With such reforms and continuing reappraisal of the tax program as it affects the economic situation, we can look toward taxation as an instrument of constructive influence in giving the fullest encouragement to free enterprise and in attaining continued prosperity.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

Postwar Preparations—VII

Self-Preparation for Peace

LET's get off the high corporate plane this month and talk about personal things that affect us as men rather than our businesses. The editor of a publication such as this has certain advantages and ways of learning things—ways that are denied to most others.

From a surprisingly large number of similar inquiries in recent months I have learned that many of the smartest men in the country have come to the conclusion that the food processing industry is the place for them and their principals and their wealth when the shooting stops and war contracts are canceled. After canvassing the entire industrial situation they have been convinced by the record of the food industry in the past 25 years that this industry is the best haven for a lot of new capital when the war is over.

Each and every one has been attracted by the stability of the food industry. It is impossible to recall how many times they have shown me their charts and curves comparing the volume of food with that of other industries in the past quarter-century. Food processing looks most alluring to men who figure on getting off the roller coaster curves of other industries at the very top of the bulge, with treasuries well filled even after current excessive taxes.

If these many interviews mean anything they mean that a lot of very determined men of wealth are going to show up in the food industry in a relatively short time. Most of them disclaim any knowledge of the food business, but they are past masters at the art and science of management and production. Some are the principals themselves. Others are management specialists who are acting as advance agents for the boys with the blue chips.

They are all smart—plenty smart. They are no respectors of tradition or the old ways of doing things; which is the reason they are in the big money right now. They are about as determined as men ever get to be. They can't see any hope of reasonable profits in anything but the food industry in the postwar years. And last, and most important of all, they have a much higher appreciation of technical knowledge than is customarily found among top men in the food industry.

There you have the picture—men with money, determination, and ability, expert in management, and with a firm conviction that the food industry has what they need, and needs what they have to offer. The only thing they lack is knowledge of food technology.

So what?

To me it adds up this way. New blood, new thinking, new money and new ideas are coming into the food processing industry. It means new bosses—bosses who are going to ask lots of questions that must be answered by sound technical facts, not by generalities, not by traditions. If the searching cross examinations to which I have been subjected without compensation are any index of the things to come, I am certain that the man on the payroll is going to get even a more thorough probing.

This coming change in the management of many companies should warn—not frighten. Some operating men are very vulnerable, especially those who regard food processing as a trade which they have learned—like a skilled trade—forgetting that technical direction of a food plant is rapidly becoming a profession.

A university education is not necessary to learn food technology and food engineering, though it helps a lot. One of the best food technologists in the United States got his education the hard way by constant home study at night and on week-ends. It took him many years of effort to get where some chaps get in four years of university work, but he was also working and gaining many years of industrial experience. On the other hand, there are men who have received a splendid training but have quit studying because they erroneously have thought school was over. And in between are thousands of practical men who have emerged from punching a time clock and seem to believe they are great successes. Measured by their own past they have progressed mightily, but in the postwar world past progress will not be a guarantee of success. The time is soon coming when it will be necessary to run like hell in order to stand still. With all this new money and new thinking coming into the food industry, plus the many mergers that are now taking place, it should be apparent to all that self-improvement by study and attendance at meetings of technical and professional societies ought to be on the program for postwar preparations of every ambitious man in the food processing industry.

True, the aim of postwar planning of the Committee for Economic Development is to create jobs for the returning soldiers and sailors. But giving another man a job can help the national problem only when there are capable, competent men to direct the work of the newcomers. To help in the solution of the national problem you must undertake to prepare yourself to discharge greater responsibilities. Regardless of all else, however, every man in the food industry must resolve to improve his own education and knowledge by study or he will be left behind in the postwar rush for jobs.

L. V. Burton EDITOR

The Talk of the Industry

• WHETHER or not General George C. Marshall criticized organized labor for threatening to strike the steel and railroad industries, the comment was a good thing. The patriotism of men who would tie up basic industries in time of war is in serious doubt. The yelps of acute anguish from William Green of AF of L and other labor leaders shows that the critic came close to the truth.

• SOLDIERS in the South Pacific, so we are told by one who has just been all over the area, know the news of what's going on back home just about as soon as the folks in the U. S. A. All important posts are equipped with short-wave radio and put out mimeographed news summaries for those who can't listen in. Soldier reactions to news of strikes and threats of strikes of civilian workers is dangerously violent.

Wonder if labor leaders realize the trouble they are building up for themselves?

• THE recent death of Professor Russell H. Chittenden, one of the pioneers in nutrition in this country, recalls an incident that should be in the record. Years ago "Chitty" was appointed to a referee board by President Theodore Roosevelt. His job was to find out what sodium benzoate in food did to human beings, for those were the days when food preservation was more a matter of opinion than solid fact.

A few Yale students were the test animals, volunteering for the job because it offered free room and board in exchange for certain restraints on their liberty plus dutiful collection of excreta for analysis. One member of the test squad, now a white-haired grandfather, has told us that the food served to the boys in the laboratory-dormitory was so poorly prepared by the janitor (sic) that they were driven to desperation. The informant says it was so horrible that one night he decided to elude the jailer-janitor by climbing down a rain pipe from a second story window. He was followed by another, and the pair went to Heublein's Restaurant, which old-timers will recall before it burned in the last World War. Each ate one of Heublein's famous steaks with all the trimmings and boastfully returned via the drain pipe. On each succeeding night more joined the excursions to outside restaurants.

In due time "Chitty" just about went crazy, for his test animals were gaining weight, the gains coinciding with the addition of sodium benzoate to the food after the initial benzoate-free diet period had closed. The weight gains were, however, much too large to be accounted for by the laboratory fare; which gave Professor Chittenden the clue. Finally he caught the boys in the act of getting out, read the riot act, promised better food to his test subjects and repeated the tests. For a while, however, the indirect effect of vile food was to make out an apparently good case for benzoic acid.

• CHARLES P. MCCORMICK, president of McCormick & Co., Baltimore, is one of the few food manufacturers who have written a book. His "Multiple Management" is a very enlightening volume by a man who knows how to develop and bring out the best in the people in his organization.

Dr. Ira D. Cardiff, president of Washington Dehydrated Foods Corp., Yakima, Wash., has two recent volumes to his credit. One is "A Million Years of Human Progress," it being a history of mankind's discoveries and inventions from 'way back. His latest, "The Deification of Lincoln," is a critique of the Lincoln legends.

H. W. Roden, president of Harold H. Clapp, Inc., has written a mystery novel "You Only Hang Once."

Hors d'Oeuvres

• Meat vitamins and proteins can be replaced with flour from cottonseed, peanuts and soybeans, says a medical authority. Perhaps, but if it won't make good gravy it's no substitute for meat.

• *A leading brewery refuses to sell its beer for consumption by prisoners of war. That'll punish 'em.*

• One-eighth of the women workers in industry quit their jobs every month. Even women seem to think that woman's place is in the home.

• *At Davisville, R. I., 550 Seabees forsook their regular mess to eat dehydrated foods prepared in an experimental galley. The seabees are noted for their courage.*

• Los Angeles consumes more than 3,000,000 rabbits annually. It's inspiring to know that the well-known rabbit habit is serving a useful wartime purpose.

• *Civilian per capita consumption of food in this country was 5 percent less last year than in 1941. And therein you see the point in points.*

• The U. S. Rubber Development Corp., having gained experience in gathering rubber in Nicaragua, will not in the future need the aid of William Wrigley Co. in this operation. So Wrigley won't have to worry now about getting its shipments of raw materials mixed up and producing little sticks of all-weather tread.

• *The Germans make synthetic fuel. From the process is left a residue which they use in making soap. But they have something left over after that so they make it into butter. German products, like German self-importance, are mostly synthetic.*

• Some oyster shucking plants have lost more than half of their workers to shipbuilding yards and aircraft factories, a sampling survey shows. Apparently workers would rather wrestle with rivets than bisect bivalves—especially when it pays better.

• *A million families became beer consumers for the first time during 1943, and most of them were in the upper income brackets. Looks like the liquor shortage has caused a lot of people to shelve the shaker and roll out the barrel.*

• The story is going the rounds that the new jet-propelled fighter plans flys so fast it sucks in birds just as a vacuum cleaner sucks in dust. That we can take, but the rest we give you merely as hearsay: "The birds are ejected at the rear, skewered, cooked and ready to eat."

• *A survey shows that 90 percent of husbands eat breakfast in from 10 to 20 minutes. It's comforting to know that you're a member of the majority.* F.K.L.

Sovfoto

Europe itself must bear the major burden of raising the food that its hungry inhabitants are to eat after the war. This scene of peasant women gathering grain after a German retreat in Russia will be repeated in all parts of Europe after victory.

FOOD—FIRST IN PEACE

Enduring peace cannot be built upon a cornerstone of famine. The world's resources must be focused upon the job of feeding a half-starved Europe for at least two years after victory

THE food industry of the United States will have a vital role in a feeding program unprecedented in history. To give the food manufacturer a glimpse of what may be anticipated we present this summary of a report issued by the National Planning Association following a survey of the world's food situation and the adjustments that will be necessary to feed the liberated peoples after the German surrender.

PREPARING to help feed the hungry civilian populace of the liberated European countries is nothing more than intelligent recognition of a task that must and will be done. Self-interest alone demands that these peoples be fed, for the alternative is anarchy, requiring thousands of Allied troops for police purposes.

In recognition of this combination of practical and humanitarian reasons the United States and 43 other nations agreed on November 9, 1943, to participate in the United Nations Relief and Rehabilitation Administration. Their immediate job is to examine the size and nature of the food relief problem and to lay plans now for the first two years after victory for we cannot take over such a task on short notice.

Must Help Self

The biggest job in European relief is getting Europe's own agriculture producing again; for the main responsibility for feeding Europe after victory will fall on Europe herself. Before the war Europe was about 90 percent self-sufficient. Of course, in some foods the percentage was greater than in others. The average consumption for European adults, however, in the middle 1930's was about 2,900 calories.

The vital question therefore is: What will Europe herself be able to produce? And the corollary questions are: How much relief food should the United Nations try to stockpile or plan to produce? What kinds of relief foods are most essential to balance the European diet?

From the bits of information available, from our experience in North Africa, Italy and the Ukraine and from the history of World War I, we may broadly guess that the biggest problem Europe will face immediately after the German surrender will not be the production of food, but its distribution. Poorly distributed food can have results just as disastrous as a lack of it. The physical transportation of food is only one phase of the problem. The farmers must first be induced to give up their produce.

During the Axis occupation the farmers have been secreting food, slaughtering and eating animals on the sly and otherwise failing to give up the food to their oppressors. If this tendency should continue after the liberation it would have the most disastrous results.

In the long run there is only one way to make sure of getting the maximum possible collection of food from Europe's farmers, and that is to be able to furnish the consumer goods which the farmer needs and wants in return for his crops.

Parallel with such inducements will be the stimulus of patriotism. Where these are not enough there must be a campaign of education and pressure. The habits of withholding food and dealing in black markets must be combatted with every weapon of persuasion that the governments of the liberated areas can bring into play, lest the practices common during Axis occupation persist.

A final effective method of bettering the distribution of food in postwar Europe will be in the use of relief

foods. Since the total amount of imported food needed depends not only on Europe's total production but also on its distribution, the relief foods should be used in such a way as to correct any lack of balance.

Transportation should not present a very great problem. The destruction wrought by the retreating Nazi armies will, in the main, be repaired by the advancing forces of the United Nations.

Damage to Industry

The food processing industry of Europe is likely to be hard hit. It is expected that the processing facilities will suffer about the same amount of destruction as befalls Europe's other manufacturing plants. Recent dispatches from Italy indicate that all flour mills are being singled out for destruction by the retreating Nazis. These processing facilities must be repaired with the greatest speed, for wheat must be milled into flour; meat butchered, cured and stored; oil crops pressed, butter churned, packed and transported.

Manpower should be adequate, though there may be shortages in particular areas such as Poland and the Ukraine. And, unless the character of the war changes radically, the damage to soil probably can be disregarded.

But the soil will not be as productive. With most of the essential types of fertilizer extremely scarce throughout Axis Europe, cultivation of the land has had to suffer. This general shortage of fertilizer has probably reduced the productivity of Europe's fields by 5 to 10 percent. A really significant increase in production per acre is possible in the first year or two after victory—if we increase adequately the supply of fertilizer, especially phosphates. And looking toward the meeting of this demand a very large phosphate stockpile should be begun at once in French North Africa, where the yearly production of phosphate rock exceeded four million tons in prewar years. A desirable goal for such a stockpile would be in the neighborhood of one year's production.

Livestock Low

European livestock has suffered a drastic decline. Reliable reports indicate that in Germany, the number of pigs is more than one-third lower than before the war, while cattle has declined about 10 percent. The decline in Denmark, the major livestock country of western Europe, is similar to that in Germany in both pigs and cattle. The number of Belgian pigs is believed to be hardly half what it was before the war, while beef and dairy cattle are down about 10 percent. In Holland the pig numbers are said to be less than a third of normal, with both beef and milk herds down 25 percent. The low point in Dutch livestock herds is not yet in sight, for the Nazis are vigorously pressing a compulsory slaughter campaign due to the shortage of feed. Polish dairy cows not producing up to a certain standard are ruthlessly slaughtered. Draft animals have been seized by the Nazis in vast numbers throughout the occupied countries.

This situation may well get worse during the closing months of the war. As defeat comes closer, the Nazis are capable of slaughtering large numbers of farm animals for their own temporary wants and to prevent them from falling into the hands of the United Nations. It may be anticipated, therefore, that the sharpest reduction will be in hogs and beef cattle and that the dairy herds will suffer the least. This decline in livestock will also result in a drastically reduced supply of manure upon which prewar European agriculture was more dependent than it was upon prepared fertilizer.

The demand for hand tools should be relatively easy to meet, while the tractors now used for military operations can readily be converted to farm uses. Such will not be the case, however, with plows, harrows, planters, harvesters and the like. The only answer here is to plan for substantial shipments immediately after victory, with emphasis placed upon the planting and cultivating machinery. American implement plants, now engaged in producing tanks, ordnance and the like should be among the first plants released in any "cut back" in the production of armament.

Seed is Needed

The vegetable seed situation also requires prompt action. We cannot count on the necessary seed being available in Europe itself. As American production seems to have already reached a practical maximum it is important that production of vegetable seed be expanded in Central and South America, North Africa and other areas open to the United Nations. A desirable goal would be the building of a stockpile equal to perhaps one-half of the total United States seed production in 1942.

There will be heavy pressure from Europe and from some Americans to ship large numbers of livestock to help replenish the depleted herds of Europe. But when the problems of shipping, the risks of disease, the differences in climate and the necessity of also shipping feed for this stock is considered, it is realized that a sounder policy will be to let European livestock numbers increase slowly from existing herds and from a few carefully selected foundation animals.

Crop Pattern of Nazi Europe

The most significant change in the food production pattern of Europe under Nazi occupation has occurred in the kinds of food produced. Prewar Europe met nearly one-fourth of its total diet needs from food of animal origin—meat, eggs, milk, cheese and the like. In Nazi Europe, on the other hand, foods of animal origin make up only about one-sixth of the total, and the percentage is still declining. In terms of individual foods, Nazi Europe eats less than half as many eggs as prewar Europe, 40 to 50 percent less milk, fats and oils and about one-third less meat and cheese. Wheat bread has remained about the same, while the consumption of potatoes and other fresh vegetables has greatly increased. In fact, cereals and potatoes furnish probably two-thirds of Europe's total calories today.

Keep Nazi Plan

It should be recognized that, on the whole, this Nazi food production plan has been highly successful. Indeed, one of the essential and one of the most difficult jobs which the United Nations will face in the critical period just after victory will be to maintain broadly the same food production pattern as that imposed on Europe by the Nazis. For maintained it must be if starvation is to be averted in Europe. Food crops which are directly consumed by humans are usually several times as efficient as foods of animal origin in terms of total land, equipment, labor and other resources spent in producing them. And Europe's slender resources must be used as efficiently as possible during the critical period. To educate the farmers of Europe to continue the hateful, unfamiliar crop pattern that was imposed by the Nazis will be a herculean job based above all on frankness and good-will. If we can preserve, temporarily, the emphasis on production of vegetable foods, Europe should be able to supply from four-fifths to seven-eighths of her mimimum food needs in the first two years after Germany is defeated by the allied nations.

In estimating Europe's food needs, a relatively low minimum goal of 2,000 calories per day has been set. That this is a minimum and not an average should be borne in mind. Attention must also be given to making the diet a balanced one; for a diet low in quantity must be high in quality, particularly in the protective foods—proteins,

International

Two of hundreds of Italian refugees fed daily by "Amgot" officers in Naples. A happy, prosperous and enduring peace cannot be built unless famine is first eliminated.

minerals and vitamins. In this connection, it should be pointed out that the average civilian diet of Europe has declined between 15 and 20 percent since the beginning of the war.

What is Needed

We have now come to the point where we can begin to estimate roughly the amount of relief foodstuffs needed from outside Europe to set a "diet floor" of 2,000 calories per day. *If* demolition is not too much worse than we have anticipated; *if* Europe's farmers will continue temporarily to concentrate on the production of foods of vegetable origin; *if* the United Nations are ready at the right time to ship in the essential requirements of fertilizer, seed, implements and other production supplies; and *if* food collection, processing, and transportation facilities can move Europe's own food production from farm to city and from surplus to deficit areas in a reasonably adequate fashion—*then* total food imports during the first two years should be about 9,000,000 metric tons per year.

To suggest a very rough division of this tonnage which is in line with current British and American thinking, 5 to 6,000,000 tons would be in grain, 500,000 tons would be in fats and oils, while high-grade proteins such as meat, fish, eggs and cheese would make up 7 to 800,000 tons. There would also be the equivalent of 1,650,000 tons of milk, chiefly in the form of dried skim milk and perhaps dried whey. There would also be roughly 300,000 tons of soybean products and other beans and peas, 400,000 tons of sugar and a few smaller items.

Shipping Adequate

After weighing all the factors, it can be concluded that adequate shipping will be available to move this amount of food across the Atlantic. There may be temporary shortages at certain periods when Pacific demands are especially heavy—for we are assuming here that the war in the Pacific will continue for some time after the German collapse. Special types of shipping such as refrigerated space may not always be available.

Who Can Supply

The simplest way to establish the supply picture of the various foods needed for shipment to Europe is to take the estimated needs, commodity by commodity, and see where they may be obtained. The British Isles, Russia, the Middle East, Australia and New Zealand, Indo-China, Burma and South Africa must be ruled out, either because their own food supply is inadequate or because their surplus will have to be shipped to the armed forces in the Pacific, or finally because they are now occupied by the Japanese.

The Toughest Job

The most difficult foods to supply for European relief will be edible fats and oils, such as lard, shortening, margarine and other similar products. The size of Europe's needs for fats and oils is such that the United States alone could not supply them. Fortunately there is no need for the United States to supply the entire amount. Due to lack of proper storage space in the U. S. and other considerations, a rather heavy stock of fats and oils is in Britain today. If the final months of war do not increase the present demand, Britain will be able to release these stocks, representing 200,000 tons or about two-fifths of the first year's need in Europe. Latin America will probably be able to supply another 200,000 tons. There remains for the United States to furnish roughly 100,000 tons, about half of which will come from current production and half from stocks on hand. These estimates are based on the, by no means certain, assumption that Europe will produce 3,500,000 tons of edible fats and oils.

Thus, theoretically, Europe's needs can be met for the first year without serious cuts in present consumption. In the second year, the stock which provided half the first year's need will not exist. If the European requirements for the second year remain close to the first year estimate, the need will be difficult to meet. There are some supplies abroad, however, which cannot be tapped now because of the difficulties of shipping. It should be possible to get at these once the war in the west ends.

Moreover, there is no need to be satisfied with the current production of fats and oils in foreign countries. Modern American equipment would boost the already large production of peanut oil in French West Africa. Some Latin American countries could also increase their production to the extent of perhaps 300,000 tons. In recent months Argentina has used several thousand tons of linseed oil for fuel. It might be well for the United States to supply Argentina with a relatively small amount of fuel oil thereby saving substantial quantities of edible oil which is more expensive and in much tighter supply. And all such ideas as that recently advanced in the United States for using lard for soap making, should be discouraged.

Meat

The relief need for animal proteins, such as meat, fish, eggs, and cheese, will be about 800,000 tons, of which 600,000 tons would be represented in meat. This is about 6 percent of the

total yearly consumption of meat in the United States. With South America able to supply probably half of the relief supplies in these commodities, this requirement should be met without difficulty.

Milk

The United States will probably have to supply all of the 1,650,000 tons of milk which we have estimated Europe will need in the first year. This can be done if consumption in this country can be held at its current level of 59,000,000 tons, and the 1,650,000 tons diverted from the more than 14,000,000 tons of skim milk and buttermilk fed to livestock during 1943. This will involve the collection of far greater quantities of milk from the farms for separation at the creameries than are being collected at present. It will also mean the swift erection of drying plants in selected areas, as it will have to be shipped in the form of dried skim milk.

Vegetables

The vegetable proteins—generally dry beans and peas—are quite important in the European relief picture because of the comparatively small quantities of animal proteins that will be available to Europeans for some years to come. The estimated needs of about 300,000 tons per year, seem possible only on the assumption that approximately three-fourths of this total will consist of soya products. The farmers of the United States are being urged to increase their soya acreage—already very large—in 1944. These soybeans are normally pressed for oil and the remainder fed to livestock. Thus, to supply Europe with three-fourths of its needed vegetable proteins in soybeans would not even reduce the feed supply in the United States to any great extent.

The other beans and peas can be supplied in considerable quantities from outside the United States. It is estimated that Mexico, Brazil, Argentina, Peru and Chile could increase production of various beans and peas by at least 300,000 tons if we encouraged them to do so. And if production of these vegetables was vigorously pressed in Canada and French North Africa, it is possible that the entire amount might be supplied from outside the United States.

Wheat

Wheat is the largest food item in the European relief picture, and it is fortunate that wheat is less of a problem than most of the other foods. The estimated 5,000,000 tons needed—about 170,000,000 bu.—can most easily be supplied by Canada, with some help from The United States and the Argentine. Canadian wheat stocks today and during the foreseeable future are large enough to supply this quantity without further development in production. The only problem with Canadian supply will be the transportation of the wheat to the Atlantic coast. Small amounts may from time to time be required from the United States and Argentina when Canadian rail transport is under heavy strain. It may come as a shock to many Americans to learn that by July 1, 1944, the wheat stocks in the United States, estimated at 250,000,000 bu., will be very little more than the amount needed for seed, normal distribution and the minor crises that may arise. The wheat surplus days of the 1930's are gone.

Sugar

The sugar could not be supplied by the United States from our own production, though we may be able to draw enough from existing U. S. stocks, on a loan basis, to help meet the 400,000 tons needed. Likewise, sugar supplies, even in Cuba and other Carribean islands, are distinctly tight due to the large alcohol production program. It is too early to say whether the entire European relief need for sugar can be met, and from where. The development of new processes for making alcohol and the possible reopening of the Philippines supply may improve the situation.

The Bright Side

There is a bright and a dark side to these calculations. On the bright side we have assumed that military, Lend-Lease and other noncivilian needs will take as much of the U. S. food output as in 1943. It is entirely probable that these needs will be cut as soon as peace comes to Europe. If the total noncivilian needs were reduced by as much as 10 percent, it would greatly ease the problem of relief foods from the United States. Likewise, the huge military stocks now on hand in foreign lands and in transit, representing in all a six- to nine-month advance supply, could be diverted to some extent, to the immediate relief needs.

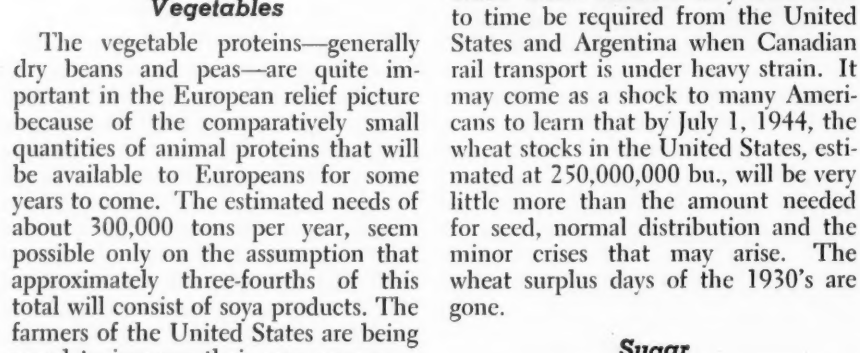
There is also a dark side. All these estimates are based upon the assumption that we will have reasonably good crop weather. Will we? The United States has just been through seven years of crop weather unmatched, perhaps, in the history of the nation. It might seem almost too much to hope that the law of averages will permit us to enjoy an eighth.

If 1944 or 1945 should be really bad, all our percentages and figures will vanish; even military and Lend-Lease needs would have to be pared to the bone; and American civilians would rapidly learn how much belt-tightening a nation can really do in time of crisis. American farmers, however, will have little to fear and much to gain from the foreign development and domestic adjustment necessary to help meet these European relief needs.

Time to Act

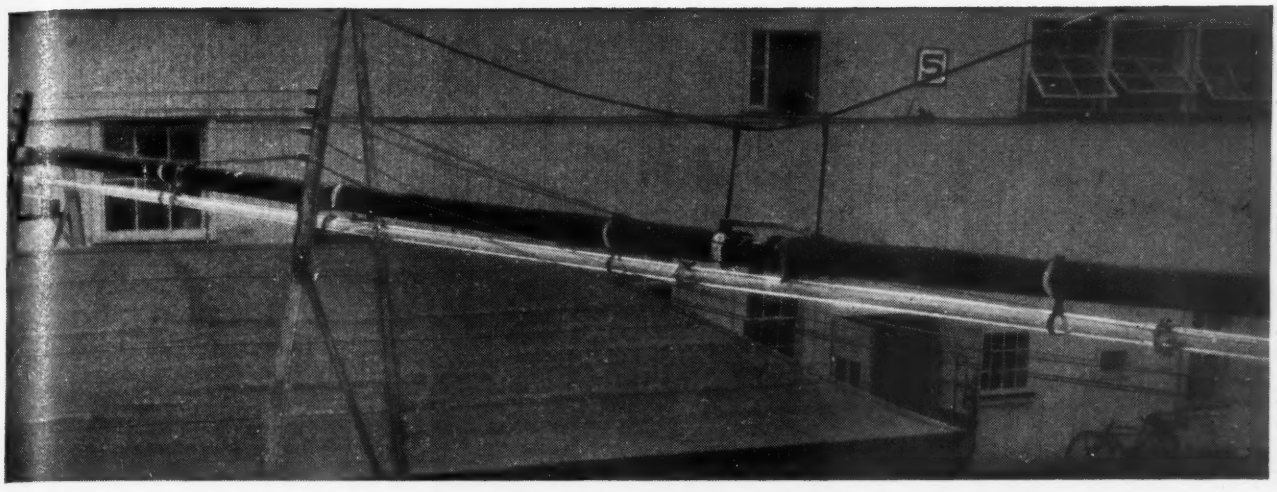
The keynote of this war is "time." And nowhere is "time" a more vital factor than in feeding Europe after victory. There is very little of it left in which to prepare to furnish the production supplies which Europe will need immediately upon the defeat of Nazi Germany, if she is to produce a heavy percentage of her own food. There is all too little time to make domestic adjustments in American food production which will lessen the burden of relief upon American consumers and frequently eliminate the burden entirely. There is even less time to encourage increased food production in Latin America, North Africa and elsewhere, to offer the prices necessary to get the desired production increases, and to arrange for more processing and storage facilities.

The time to act is now—for we are already very late.



Sovfoto

These villagers of the Orel region are returning to their homes with the livestock they managed to hide from the invader. Food hiding will be a problem in peacetime.



Three-inch outdoor tomato pulp transportation line of glass piping.

How Glass Piping Is Used In Food Processing Plants

By A. H. FUNKE, P. J. Ritter Co., Bridgeton, N. J. and
J. R. BLIZARD, Industrial Division, Corning Glass Works, Corning, N. Y.

Easier cleaning and sanitation, freedom from corrosion, and lower heat losses are advantages obtained from the use of glass piping for food plant pipelines

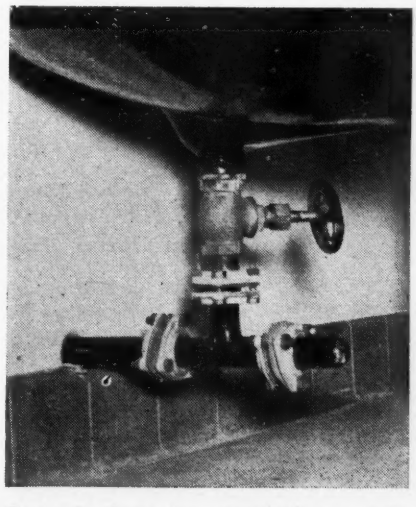
GLASS piping has already proved economical and practical for the hard service encountered in the modern food plant. Some installations have been in service ten to fifteen years and there are many others over five years old. Their good service records, together with the readily apparent advantages of glass pipe, are stimulating widespread interest among food-plant engineers and operators.

Installing and operating the extensive glass pipe systems at the P. J. Ritter Co. Bridgeton plant have focused our attention on the interesting and important phases of glass pipe utilization. Our purpose in this article is to describe glass piping and to set forth our observations for the benefit of the many new glass pipe users. Specifically, we will cover the following points:

1. Breakage
2. Thermal shock resistance
3. Advantages of glass
4. Installation
5. Maintenance
6. Cost

Glass pipe is made with inside diameters of 1, 1½, 2, 3 and 4 in. Connections are made with cast iron flange sets that grip conical tapered flanges on the glass. Pieces are prefabricated in desired lengths at the manufacturer's plant.

A complete line of fittings is available, and special pieces such as reducing elbows and tees, manifolds, long radius bends, and so forth, can be supplied easily.



One-inch glass pipe connected to a tank.

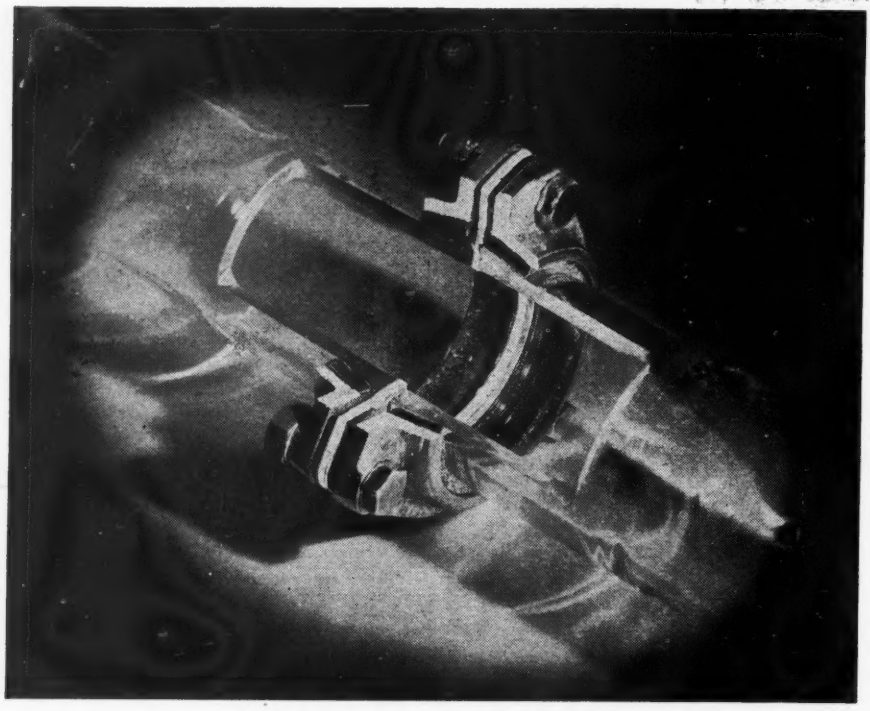
Adaptors for connecting to tanks, pumps, valves and other kinds of pipe are readily obtainable from the maker or, if desired, they can frequently be made on the job with material from the stockroom.

The conical flanged joint is illustrated in one of the accompanying photographs. Only glass and the ⅛-in. wide gasket face touch the liquid being carried. There is no pocket or crevice, and the pipe is consequently easily cleaned. Tests in New York State dairies have shown that glass piping with this same joint can be used safely for milk because it can be thoroughly cleaned in place without daily dismantling.

Pressures and Temperatures

Operating pressures can be as high as 100 lb. per square inch, provided there are no severe pulsations. Water hammer and bad pumping shocks should be eliminated entirely or minimized by providing air cushions, for they can blow out gaskets or damage the glass. Actually, glass pipe can resist severe hydraulic shocks, but this kind of treatment should be avoided.

Temperatures as high as 250 deg. F. present no difficulties and, if necessary, the glass can be used at temperatures of 400 deg. F. or over, provided precautions are taken to prevent severe thermal shocks in these higher tem-



Cut-away section of conical flanged joint for 2-in. glass piping. Iron flange and rubber gasket are shown in white. Asbestos insert for cushioning metal flange against glass is shown in black.

perature ranges. Certain chemical manufacturers regularly use it at over 500 deg. F. The glass itself is not affected by temperature alone until it reaches about 900 deg. F.

Glass pipe is not corroded or measurably affected by any of the fluids ordinarily used in the food plant. Hot strong caustic solutions, hydrofluoric acid and hot concentrated phosphoric acid will attack glass, and they should be avoided. Virtually any cleaning solution can be used without danger.

Breakage of Glass Piping

Questions about mechanical breakage are the first ones asked by plant operators unfamiliar with glass. This is easily understandable. Breakage of glass piping can be a problem if the piping is not properly installed.

Breakage is not a problem, however, if installation strains are avoided and if the piping is protected at particularly vulnerable spots. (See suggestions which follow under "Installation" and "Maintenance.")

Proof of the ruggedness of glass pipe is found in the fact that it is successfully used in food plant kitchens—places where much pipe is crowded into a small, very busy area. The accompanying photograph of a catchup kitchen is typical of many others. This pipe has been in service for two years, and in spite of inexperienced labor and hard usage during the tomato packing season, there has been no breakage of any kind. Common sense in hanging and locating the lines contributed greatly to their good performance. The job of installation was greatly complicated because of the existing maze of steam and water piping and because the tanks were so close together. It appeared almost impossible at first but it was actually solved without any real trouble by a little preliminary planning. All of the erection work was done by Ritter's own staff of maintenance mechanics.

Since glass piping is made from low-expansion heat-resistant glass, it can easily withstand severe thermal shocks. Steaming-out lines and then flushing them with ice cold water is common practice and will not damage the glass. In addition to facilitating cleaning operations, this feature is important for operators who must cool their lines after use to check bacterial growth.

Outdoor pipelines can carry liquids as hot as 212 deg. F. without being injured if they are suddenly chilled by rain or snow. At the Ritter plant we have a 3-in. outdoor glass transportation line that is often subjected to cold rains while carrying hot pulp.

Advantages of Glass

We feel that corrosion resistance is the greatest advantage that the food processor will find in glass piping. Fruit and vegetable acids leave the piping absolutely unharmed. Brine and vinegar solutions, as well as complex sauces, have no effect upon it. Hot alkaline detergents and germicides can be used for cleaning as often as desired.

Glass is a blessing to the food processor in another important respect—it is easily cleaned. This is done by flushing the lines with a hot detergent solution followed by a cold water rinse. Hot sirupy liquids do not bake on the pipe nor cling to the walls; thus speedy cleaning is possible. Lines that do not run full rarely leave scum lines at the liquid level. Above all, there is never any question about whether or not the lines are clean when the washing is finished, for they can be visibly checked from end to end. Dismantling of the lines for cleaning and inspection is thus unnecessary. Pockets and traps due to uneven drainage slope can be readily detected and the fault corrected.

Heat loss from glass pipe (particularly outdoor lines) is lower than from metal pipe because glass is a very poor heat conductor. Therefore, in glass pipes, the fluid layer next to the inside wall is much less apt to congeal because of chilling. This is a real advantage when slow-moving, sirupy fluids are handled. Lines stay cleaner because the liquid has no chance to "set" and pumping cost is lower because of greater effective pipe diameter.

Our former catchup lines were always hard to keep clean because of the tendency of the material to burn onto the metal tubing. We have now replaced them with glass lines which can be kept crystal clear by merely pumping them out at the end of each day with a hot mild detergent followed by cold water.

Installation of Glass Piping

Installation of glass piping is quite similar to that for other types of flanged pipe.

Since glass is prefabricated, it is necessary to first make a rough pencil sketch showing the proposed line. Center-to-center and center-to-face dimensions should be shown, together with brief data on the accessories to which the pipe must be connected.

Glass valves large and rugged enough for food plant service are not yet available, and metal valves are used instead. They are installed with adaptors furnished by the pipe maker. Where possible, valves should be mounted on rigid fixtures like tanks or machines so that the pipes do not have to carry their weight. If this is impractical, the valve should be made to act as a support for the pipe by first fastening it to a post or the ceiling and then connecting the pipe to it. Any kind of valve can be used.

In mounting valves in the cooking kitchens at the Ritter plant, we found it very convenient to brace them on the tanks into which the pipes emptied.

Expansion joints are rarely necessary, because glass expands only one-third as much as steel, one-sixth as much as brass, and one-seventh as much as aluminum. A 100-ft. length of glass will expand slightly less than ¼ in. when it is heated 100 deg. F.—for example, from 60 deg. F. to 160 deg. F.

Expansion movement can almost always be taken up by allowing flexing at 90- and 45-deg. bends. Resilient gaskets make this possible. If expansion joints are absolutely necessary—as in the case of straight lines with fixed ends—they can be bought from the pipe maker. Expansion joints should be used only in vertical lines, for they make liquid pockets otherwise.

Lines with only one end fixed are most easily installed by working toward the free end. If both ends are fixed, begin at either end and make up for small errors in measurement, 1 in. or 2 in., for example, by flexing at the joints or by using short glass spacer rings.

Hanging the pipe with temporary wire or rope supports makes it easy to fill it partially with water and then check for grade, pockets, and so forth. Ordinary metal pipe hangers are then installed and the temporary supports are removed. The permanent hangers should be padded with rubber, fiber, asbestos or cardboard to prevent the glass from being scratched. Fasten the hangers to a rigid structure that will not sag when the pipes are filled with liquid. Spacing of hangers can be the same, broadly speaking, as for metal pipe. An 8-ft. interval is commonly used with good results.

In general, it may be said that any good food plant maintenance mechanic can make a successful glass pipe installation by following the rules of good piping practice, plus a little extra care in handling the glass. Installations have been made in the P. J. Ritter Co.'s plant by their own mechanics in about the same time as it has taken them to install similar sanitary-type stainless steel or prefabricated enamel-lined steel pipelines.

Maintenance of Glass Piping

Once installed, glass pipe requires very little maintenance. After the first day's operation, the flanges should be carefully tightened again to make up for loosening due to seating of inserts and gaskets under the operating temperature and pressure.

Flanges should be painted with a good metal primer covered by an acid-resisting paint.

Gaskets last a long time in most kinds of food plant service, often more than five years.

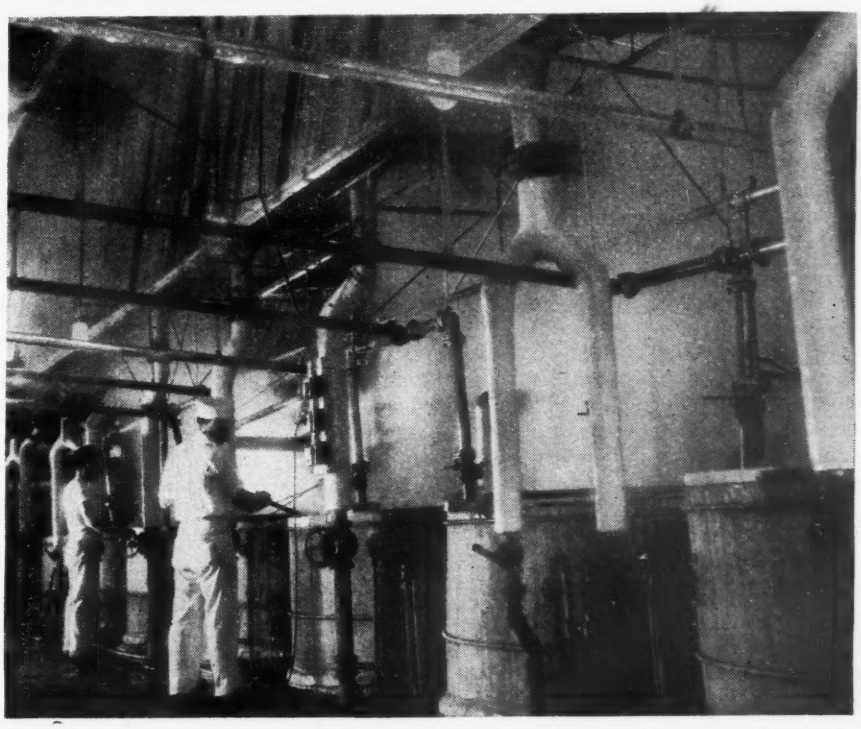
Cost of Glass Piping

Glass pipe costs are considerably higher than those for iron and somewhat more than full-weight brass or copper, but they are not high when compared to those of many corrosion-resistant alloys. The following figures are typical first costs for glass pipelines.

Inside diameter, inches	Cost per foot
1	$1.00
1½	1.75
2	2.10
3	3.25
4	6.00

Installation costs vary considerably. Representative costs for 2-in. pipe lie between 25 and 80 percent of the first cost of the glass, depending upon the character of the piping system that is required.

Good food piping has always been a serious question with food processors, and the results that P. J. Ritter Co. has had with glass indicate that it is a real solution to the problem. We feel that many other food packers will find it a practical answer to their piping problems also.



Two-inch glass piping handling hot tomato products in a catchup cooking kitchen.

Three-inch indoor tomato pulp transportation line of glass piping.

How To Vent Steam Retorts To Remove the Air Hazard

By I. I. SOMERS, National Canners Association, Western Branch Research Laboratories, San Francisco, Calif.

Air trapped in a retort may be responsible for insufficient processing because of nonuniform temperature. So tests were made to find out how to overcome this hazard. Recommendations for venting are given by the author

FOR many years factors influencing the sterilization of foods in metal containers have been studied, and it has been found that air trapped among cans in a retort during the process[1] may be responsible for insufficient processing of the cans in that area. The reason for this is that most of the heating effect of steam is a result of condensation and when air is present it acts as an insulator, preventing the steam from condensing on the cans. Since the processes for canned foods are determined on cans heated in an atmosphere of steam free from air,[2] it is essential that all the air be removed from a retort before timing of the process is begun.

A horizontal retort when fully loaded with cans still has 70 to 80 percent of its space occupied by air, and a fully loaded vertical retort has more than 60 percent of its space occupied by air.

Also, a retort only partially filled with cans contains considerably more air than one with a full load. The ease with which this air can be removed depends on the retort vents,[3] steam supply, the equipment used for holding cans in the retort, and the arrangement of cans in retort baskets.

An investigation has been made of the various means of removing air from retorts during the coming-up time[4] and of the factors which influence the rapidity of attaining uniform heat distribution.

In the investigations to date, approximately 500 heat distribution tests have been made in retorts in commercial canneries. In each test, 20 thermocouples were distributed among the cans in the retort, and the leads were connected to a potentiometer for reading the temperatures. It was thus possible to determine the temperatures at 20 different points in the retort load at intervals during the coming-up period and process.

Based upon these tests, vent instal-

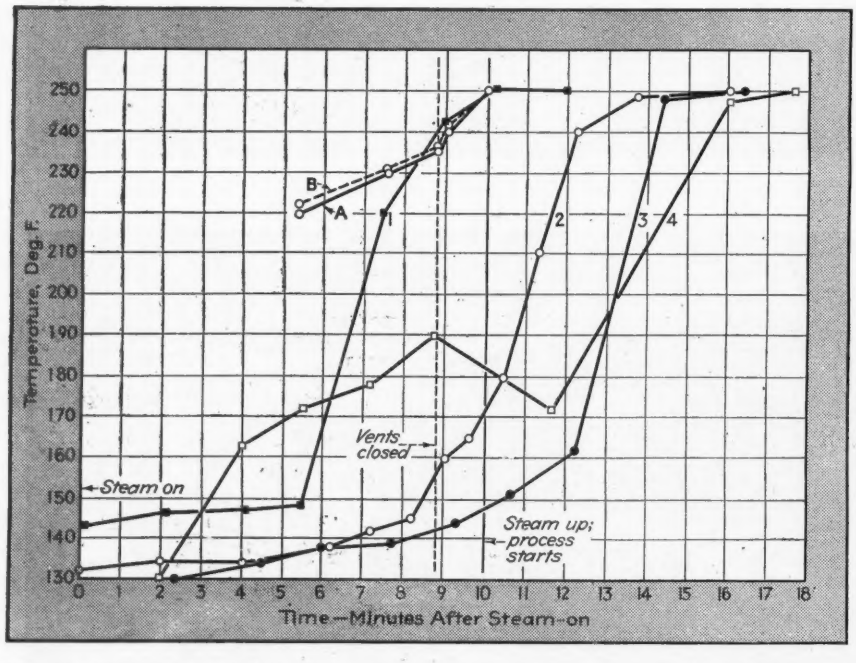


FIG. 1. Results of test indicating temperature-pressure agreement unreliable as criterion of complete air removal. Points on curves 1, 2, 3 and 4 represent the temperatures at intervals at four different places among the cans in the load. Thermocouple 1 was in a well vented area, while thermocouples 2, 3 and 4 were located in "air pockets." Points on curve "A" represent the temperatures indicated by the mercury thermometer at intervals during the coming-up time and points on curve "B," the temperatures which corresponded with the pressure-gage readings. The timing of the process was started when the mercury thermometer indicated 250 deg. F. and is shown on the figure by the vertical line at the 10-minute interval. At this time agreement was indicated between the pressure-gage and mercury-thermometer readings.

FIG. 2. Retort truck partially loaded with cans stacked vertically in small, single-layer strap-iron trays. The trays measure 13½ x 17½ in.

FIG. 3. Vertical can arrangement in large, single-layer strap-iron tray. This type of tray usually is square, 37x37 in.

FIG. 4. Vertical arrangement of cans in a strap-iron crate, showing staggered placement of cans.

FIG. 5. This vertical arrangement of cans in a perforated crate is not desirable, as it interferes with the passage of steam.

FIG. 6. Jumbled arrangement of cans in a perforated crate.

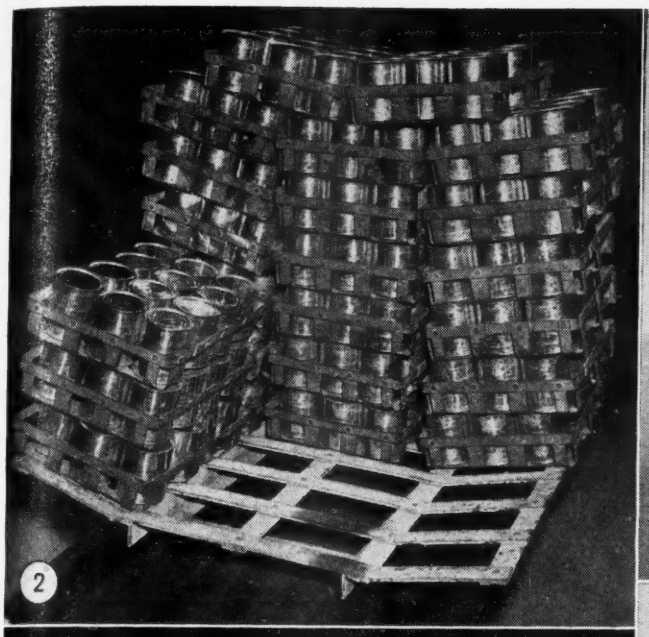
FIG. 7. Cans arranged horizontally in a large perforated gondola.

[1] The term "process" designates the heat treatment expressed in terms of temperature and time given the product after the container is permanently sealed.

[2] Processes for nonacid canned foods in metal containers are given in the N. C. A. Process Bulletin 26-L, Fifth Edition.

[3] The term "vents" as used here refers to large valve-controlled openings used for releasing the air from retorts during the "coming-up period."

[4] By "coming-up time" is meant the period from the time the steam is turned into the retort until the processing temperature is reached and the timing of the process is begun.



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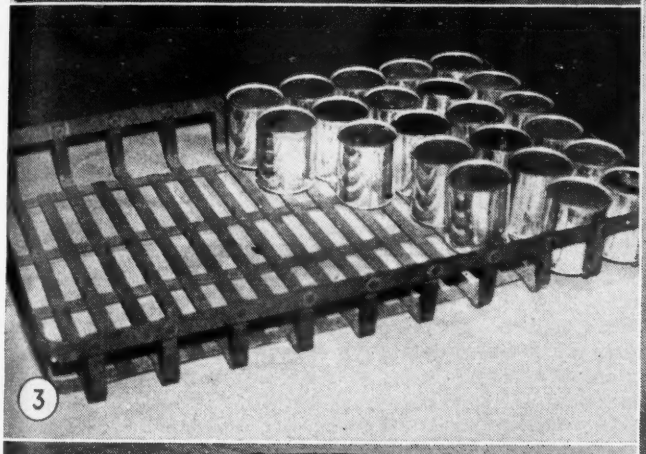

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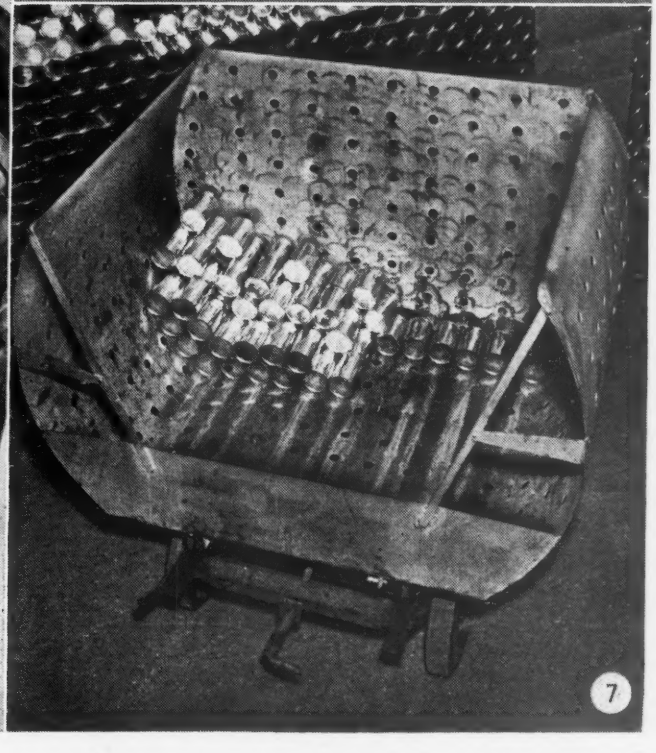

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How To Vent Steam Retorts To Remove the Air Hazard

By I. I. SOMERS, National Canners Association, Western Branch Research Laboratories, San Francisco, Calif.

Air trapped in a retort may be responsible for insufficient processing because of nonuniform temperature. So tests were made to find out how to overcome this hazard. Recommendations for venting are given by the author

FOR many years factors influencing the sterilization of foods in metal containers have been studied, and it has been found that air trapped among cans in a retort during the process[1] may be responsible for insufficient processing of the cans in that area. The reason for this is that most of the heating effect of steam is a result of condensation and when air is present it acts as an insulator, preventing the steam from condensing on the cans. Since the processes for canned foods are determined on cans heated in an atmosphere of steam free from air,[2] it is essential that all the air be removed from a retort before timing of the process is begun.

A horizontal retort when fully loaded with cans still has 70 to 80 percent of its space occupied by air, and a fully loaded vertical retort has more than 60 percent of its space occupied by air.

Also, a retort only partially filled with cans contains considerably more air than one with a full load. The ease with which this air can be removed depends on the retort vents,[3] steam supply, the equipment used for holding cans in the retort, and the arrangement of cans in retort baskets.

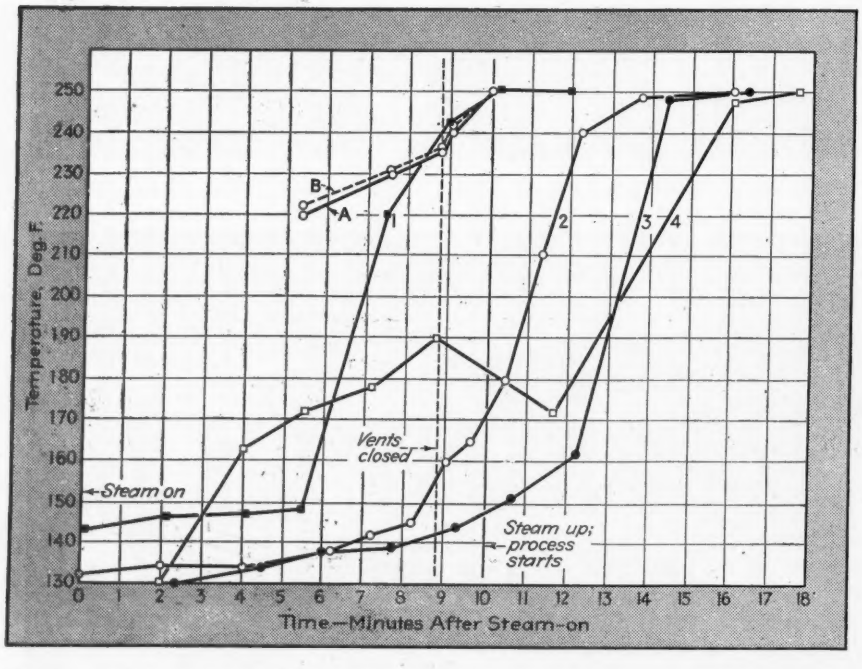


FIG. 1. Results of test indicating temperature-pressure agreement unreliable as criterion of complete air removal. Points on curves 1, 2, 3 and 4 represent the temperatures at intervals at four different places among the cans in the load. Thermocouple 1 was in a well vented area, while thermocouples 2, 3 and 4 were located in "air pockets." Points on curve "A" represent the temperatures indicated by the mercury thermometer at intervals during the coming-up time and points on curve "B," the temperatures which corresponded with the pressure-gage readings. The timing of the process was started when the mercury thermometer indicated 250 deg. F. and is shown on the figure by the vertical line at the 10-minute interval. At this time agreement was indicated between the pressure-gage and mercury-thermometer readings.

FIG. 2. Retort truck partially loaded with cans stacked vertically in small, single-layer strap-iron trays. The trays measure 13½ x 17½ in.

FIG. 3. Vertical can arrangement in large, single-layer strap-iron tray. This type of tray usually is square, 37x37 in.

FIG. 4. Vertical arrangement of cans in a strap-iron crate, showing staggered placement of cans.

FIG. 5. This vertical arrangement of cans in a perforated crate is not desirable, as it interferes with the passage of steam.

FIG. 6. Jumbled arrangement of cans in a perforated crate.

FIG. 7. Cans arranged horizontally in a large perforated gondola.

An investigation has been made of the various means of removing air from retorts during the coming-up time[4] and of the factors which influence the rapidity of attaining uniform heat distribution.

In the investigations to date, approximately 500 heat distribution tests have been made in retorts in commercial canneries. In each test, 20 thermocouples were distributed among the cans in the retort, and the leads were connected to a potentiometer for reading the temperatures. It was thus possible to determine the temperatures at 20 different points in the retort load at intervals during the coming-up period and process.

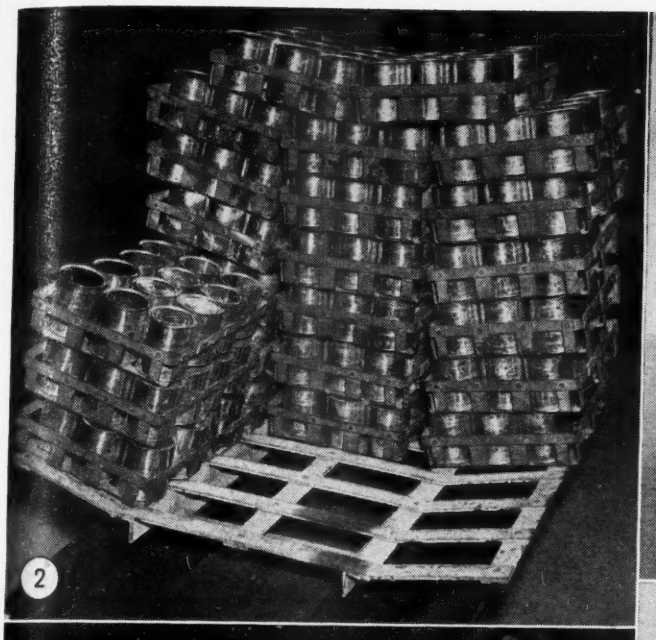
Based upon these tests, vent instal-

[1] The term "process" designates the heat treatment expressed in terms of temperature and time given the product after the container is permanently sealed.

[2] Processes for nonacid canned foods in metal containers are given in the N. C. A. Process Bulletin 26-L, Fifth Edition.

[3] The term "vents" as used here refers to large valve-controlled openings used for releasing the air from retorts during the "coming-up period."

[4] By "coming-up time" is meant the period from the time the steam is turned into the retort until the processing temperature is reached and the timing of the process is begun.



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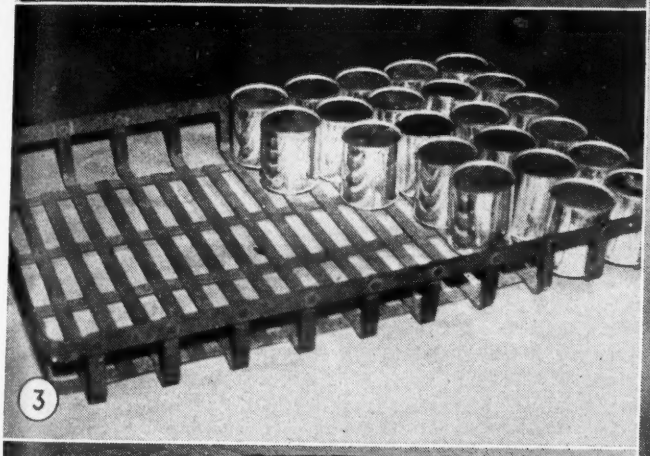

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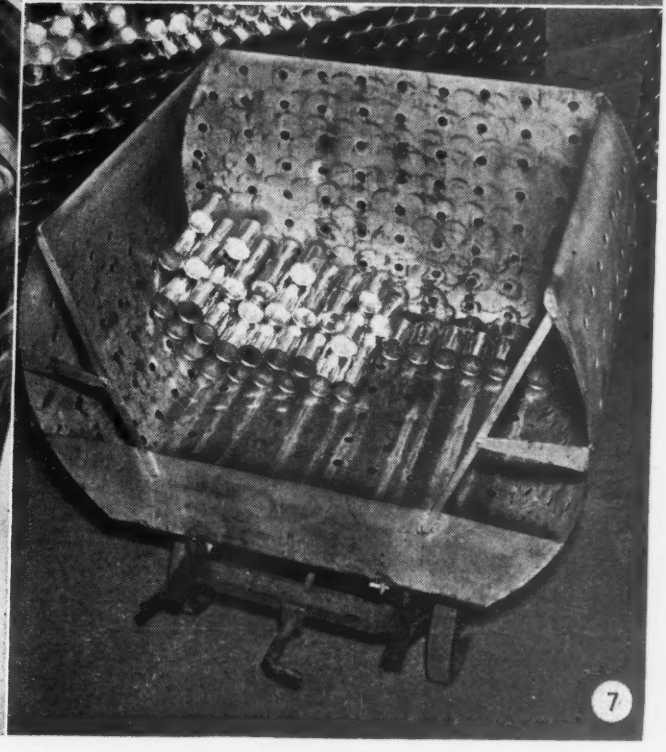

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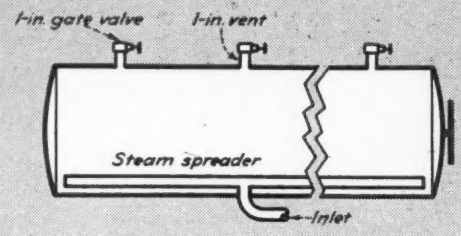
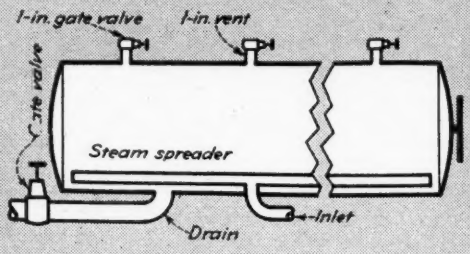
A—Venting through multiple 1-in. vents discharging directly to atmosphere[1]



Venting: Valves should be wide open for at least 5 minutes to at least 225 deg. F. or for at least 7 minutes to at least 220 deg. F.

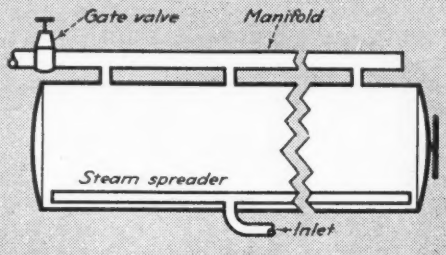
B—Venting through the drain and multiple 1-in. vents discharging directly to atmosphere[1]



Specifications	Retorts less than 15 ft. in length	Retorts over 15 ft. in length
Size of gate valve drain	3-in.	4-in.

Venting: Drain valve should be wide open for at least 2 minutes to at least 212 deg. F. and vent valve should be wide open for at least 5 minutes to at least 220 deg. F.

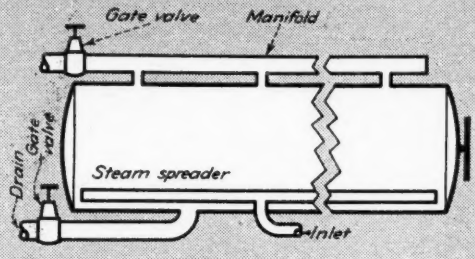
C—Venting through multiple 1-in. vents discharging through a manifold to atmosphere[2]



Specifications	Retorts less than 15 ft. in length	Retorts over 15 ft. in length
Size of manifold	2½-in.	3-in.

Venting: Manifold vent valve should be wide open for at least 6 minutes to at least 225 deg. F. or for at least 8 minutes to at least 220 deg. F.

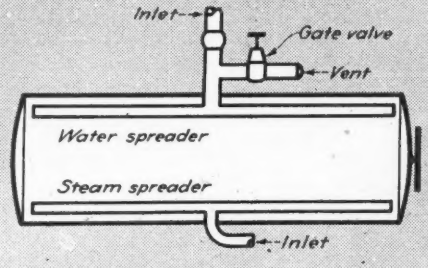
D—Venting through drain and multiple 1-in. vents discharging through a manifold to atmosphere[2]



Specifications	Retorts less than 15 ft. in length	Retorts over 15 ft. in length
Size of manifold	2½-in.	3-in.
Size of gate valve drain	3-in.	4-in.

Venting: Drain valve should be wide open at least 3 minutes to at least 212 deg. F. and manifold vent valve should be open for at least 5 minutes to at least 220 deg. F.

E—Venting through water spreader

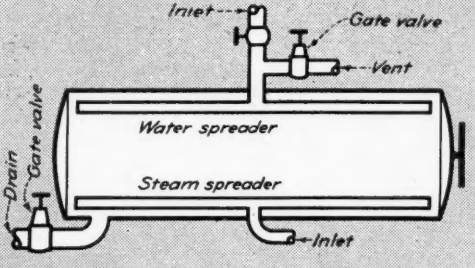


Specifications (For center water spreader inlet)	Retorts less than 15 ft. in length	Retorts over 15 ft. in length
Size of water inlet, vent pipe and vent valve	2-in.	2½-in.
Size of water spreader	1½-in.	2-in.

Venting: Water spreader vent valve should be wide open for at least 5 minutes to at least 225 deg. F. or for at least 7 minutes to at least 220 deg. F.

Number of holes in water spreader per foot: 14 to 18 3/16-in. holes; 11 to 13 7/32-in. holes; 8 to 10 1/4-in. holes.

F—Venting through drain and water spreader



Specifications (For center water spreader inlet)	Retorts less than 15 ft. in length	Retorts over 15 ft. in length
Size of water inlet, vent pipe and vent valve	2-in.	2½-in.
Size of water spreader	1½-in.	2-in.
Size of drain pipe and drain valve	3-in.	4-in.

Venting: Drain valve should be wide open for at least 2 minutes to at least 212 deg. F. and water spreader vent valve should be wide open for at least 5 minutes to at least 218 deg. F.

Number of holes in water spreader per foot: Same as in diagram E.

[1]One 1-in. vent for every 5 ft. of retort length, equipped with a gate valve and discharging to atmosphere; end vents not more than 2½ ft. from ends of retort.

[2]One 1-in. vent for every 5 ft. of retort length; end vents not over 2½ ft. from ends of retort.

FIG. 8. Vent installations and their operation. These have been found to give satisfactory heat distribution when the steam supply is sufficient to permit operations as outlined and when strap-iron or well-perforated sheetmetal stacking equipment is used. Ten venting arrangements for retorts are shown here and on the facing page, with specifications.

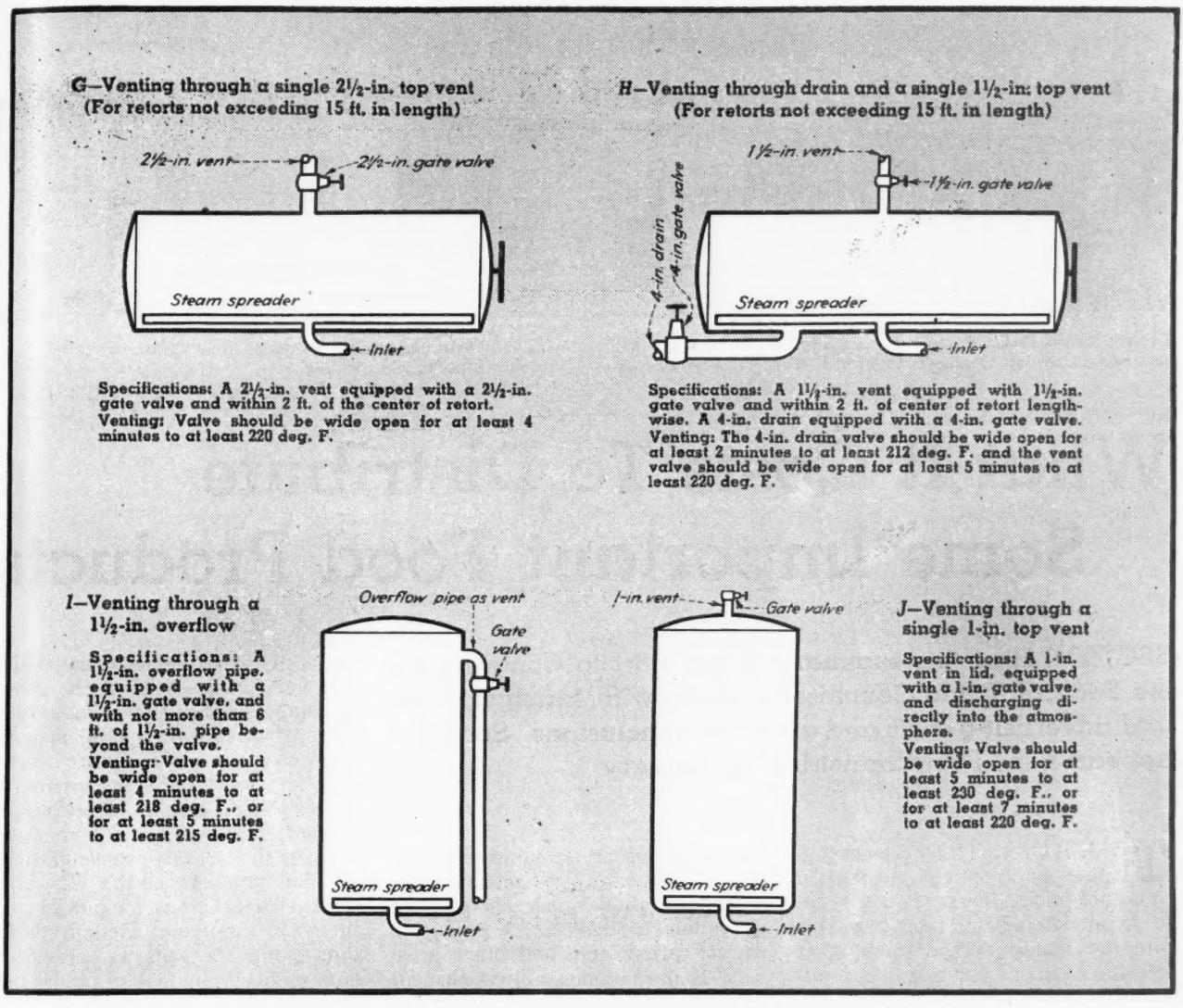

G—Venting through a single 2½-in. top vent
(For retorts not exceeding 15 ft. in length)
2½-in. vent
2½-in. gate valve
Steam spreader
Inlet
Specifications: A 2½-in. vent equipped with a 2½-in. gate valve and within 2 ft. of the center of retort.
Venting: Valve should be wide open for at least 4 minutes to at least 220 deg. F.
H—Venting through drain and a single 1½-in. top vent
(For retorts not exceeding 15 ft. in length)
1½-in. vent
1½-in. gate valve
4-in. drain
4-in. gate valve
Steam spreader
Inlet
Specifications: A 1½-in. vent equipped with 1½-in. gate valve and within 2 ft. of center of retort lengthwise. A 4-in. drain equipped with a 4-in. gate valve.
Venting: The 4-in. drain valve should be wide open for at least 2 minutes to at least 212 deg. F. and the vent valve should be wide open for at least 5 minutes to at least 220 deg. F.
I—Venting through a 1½-in. overflow
Specifications: A 1½-in. overflow pipe, equipped with a 1½-in. gate valve, and with not more than 6 ft. of 1½-in. pipe beyond the valve.
Venting: Valve should be wide open for at least 4 minutes to at least 218 deg. F., or for at least 5 minutes to at least 215 deg. F.
Overflow pipe as vent
Gate valve
Steam spreader
Inlet
1-in. vent
Gate valve
Steam spreader
Inlet
J—Venting through a single 1-in. top vent
Specifications: A 1-in. vent in lid, equipped with a 1-in. gate valve, and discharging directly into the atmosphere.
Venting: Valve should be wide open for at least 5 minutes to at least 230 deg. F., or for at least 7 minutes to at least 220 deg. F.

Fig. 8 (continued from facing page). Vent installations and their operation.

lations and procedures for their operation have been suggested. They are shown in Fig. 8. Other venting systems may prove to be equally satisfactory, but it has been shown that if the venting arrangement or operation provides for less thorough venting than is given in these recommendations, "air pockets" may remain among the cans, with the consequent hazard of underprocessing. For a coming-up time of less than 5 minutes, tests have shown that the retort must be equipped with a large steam supply and with large vents, which must be left open to a higher temperature than is given in any of these recommendations.

These studies have revealed important facts regarding the efficiency of retort practices as related to heat distribution and the influence of various types of equipment, such as vents and baskets and arrangements of cans, on the completeness of air removal.

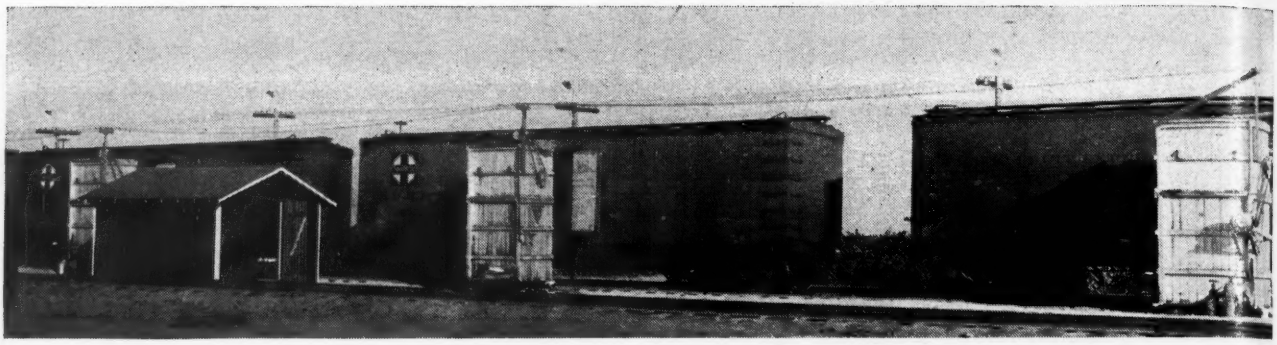
For a number of years it has been a common practice to vent retorts until "temperature-pressure agreement"[5] is indicated, without an understanding of the size of the vents required or the length of time during which they should be left open. Such a practice is unreliable, however, because as soon as the space *around* the retort load is filled with pure steam, agreement may be indicated, even though there may still be a considerable amount of air entrapped within the load itself. The presence of such air is not revealed by the readings of the retort pressure gage and thermometer. This was found to be the case in a number of heat-distribution tests, a particularly bad condition being shown in Fig. 1. This figure demonstrates that when the mercury thermometer registered 250 deg. F. (the processing temperature), the temperature in an "air pocket" among the cans was only 147 deg. F., while at the same time agreement was indicated between the mercury-thermometer and the pressure-gage readings.

However, even though temperature-pressure agreement cannot be relied on as an index of satisfactory operations, it is important that such agreement always be attained. The only way to ensure adequate venting is to adopt a tested operating procedure, which must be followed every time a batch is processed.

Vents should be located in the opposite side of the retort from the steam inlet, and for best operation they should be equipped with gate or plug-cock type valves of at least the same size as the vent pipe specified. If globe valves are used, they should be of larger pipe size than is necessary when gate valves are installed. If the vents do not discharge directly into the atmosphere, and the extension

(Turn to page 151)

[5]By "temperature-pressure agreement" is meant the condition prevailing when the retort thermometer indicates the temperature of pure steam at the pressure indicated by the retort pressure gage. Retort thermometers frequently are fitted with auxiliary scales which indicate the steam pressure which should prevail.



Transportation costs of many fresh foods are increased by the necessity of reicing shipments in transit. These refrigerator cars, used in the transportation of lettuce from California to the East, are shown at an icing station.

What It Costs To Distribute Some Important Food Products

SECTION II of this summary of a report to Congress by the Federal Trade Commission deals with transportation and advertising costs and gives the conclusions. Section I appeared in "Food Industries" in January

TRANSPORTATION charges constitute an important element in consumer prices. These charges begin to accumulate against foods even before the farmer or the stock raiser sells his product. For example, transportation costs on fertilizer, farm machinery, seeds and purchased feeds are in the cost of farm production. Other transportation charges accrue as farm products move to the processor and from the processor through wholesale and retail channels to the consumer. This does not necessarily mean that the consumer always pays all transportation charges accruing against food or other products. Circumstances may arise where transportation and other charges must be absorbed by producers, or by distributors, or by public subsidies, so that they may not be fully reflected in consumer prices. Under usual competitive conditions, however, prices paid by consumers, in the long run, must cover transportation charges, along with all other essential production and distribution costs, or products will not be produced and delivered to consumers by private enterprise.

Because of the many ways in which transportation charges accrue, there are no definite, easily applied measures of the importance of transportation in consumer prices. For instance, transportation is an element in the depreciation cost of farmer implements and machinery used in producing, harvesting and hauling which are properly chargeable to the cost of producing wheat, cotton, corn and other products. It also becomes a direct element in the cost of wheat to the miller and an indirect factor in the depreciation cost of plant and equipment chargeable to flour production. In a similar way transportation charges become both a direct, and an indirect, charge to other processors, wholesalers and retailers who handle wheat flour and products made therefrom. It is impossible from data readily available to segregate and combine into a single figure, the transportation charges properly accruing against the total cost and selling price of any particular product produced and consumed.

The nearest approach to definite statistics as to the importance of transportation charges affecting food produce is found in the averages prepared from time to time by the Interstate Commerce Commission covering the percentage relationship of freight revenues reported by Class I steam railways to the estimated wholesale value of food products at their destination.

These averages cover only rail freight as reported by railroads related to estimated values at destinations of the total tonnages moved by the railroads. These statistics covering movements of total volumes of raw materials and processed products cannot be combined as a definite measure of the importance of transportation in distribution. They merely serve to indicate how important rail transportation is to the wholesale value of products at disconnected and often unrelated steps in the production and distribution of products. Table II shows these relationships as computed by the Interstate Commerce Commission for three groups consisting (1) of selected farm products and livestock which normally undergo further processing, (2) of processed food products, and (3) of fruits and vegetables which may be consumed in their raw state.

The general showing is that, for field crops and livestock, freight, in 1939, represented from about 4.32 cents per dollar of the terminal market price of hogs which have a high value per ton, to 16.77 cents for corn. For processed food, the range was from 3.23 cents per dollar of sales for cereal food preparations to a maximum of 24.67 cents for dried vegetables. For fruits and vegetables, a large part of which is consumed in their fresh state, the range is from 11.68 cents per dollar of wholesale value for fresh berries to 62.41 cents for fresh grapes of all kinds.

Three things should be borne in mind in using these ratios for such a comparison: First, the values are wholesale and not retail values and, therefore, not consumer cost and are not based directly on sales, the values being calculated from reported wholesale prices. Second, the transportation cost is the freight revenue or line transportation cost and does not in-

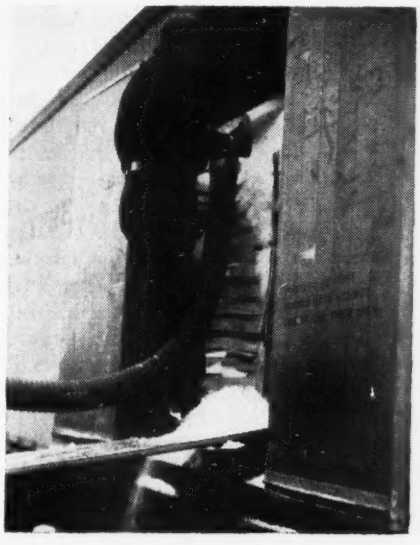
clude other transit costs in payment of various protective measures, such as heating and cooling. Third, the movement on which the ratios are based is wholly that by Class I steam railways and does not, therefore, include shipments by boat and truck.

Branding and Advertising

There has been a gradual process of evolution in the food trade from the time when foods were predominantly sold unbranded to the present situation under which packaging and branding have made it possible for manufacturers of processed foods to identify their products all the way to the consumer. Even in fresh fruits and vegetables, oranges, grapefruit, and so forth, are sometimes stamped individually with the brands of producer cooperatives or merchant shippers. Apple boxes, peach baskets, fruit lugs, lettuce crates and potato and onion bags likewise bear the brands of growers or shippers who not only brand their packages but also advertise their brands to consumers on a territorial scale as wide as the distribution of their products.

Advertising and sales promotion expense varied greatly between food products, ranging from one-fifth of a cent per dollar of net sales for sugar to 8 cents per dollar of net sales for packaged cereals. Meat and canned fruit and vegetables were among the food products bearing relatively low advertising and sales promotion expense while for flour, biscuits and crackers, and coffee such expense was comparately high. Competitive packaging of branded foods often adds greatly to their distribution cost. For instance, in the biscuit and cracker industry, the cost of containers amounted to about 12 cents per dollar of net sales. The consumer, therefore, in purchasing a dollar's worth of biscuits or crackers, spends nearly 17 cents for the manufacturer's cost of packaging and advertising the dollar's worth of product.

An advertising expense common in the food industry arises from the giving of advertising allowances by brand owners to food retailers to induce the latter to feature the brands of allowance-givers in local newspaper advertising. About 9 percent of the canners; 18 percent of the biscuit and cracker manufacturers; 34 percent of the meat packers; 37 percent of the coffee manufacturers, and 48 percent of the packaged cereal manufacturers reporting on their advertising practices indicated that they reimbursed dealers for part of the advertising expense of featuring their products. This list by no means covers all of the food lines on which manufacturers give advertising allowances to individual retailers or groups of them. The allowance may be in the form of a direct payment, a special discount off purchase price or the giving of free goods, facilities or services in consideration of local advertising and sales effort.



Close-up of a reicing operation, showing crushed ice being blown through a flexible pipe into and around crates of produce in a refrigerator car.

TABLE II—Proportions of Estimated Wholesale Delivered Value Represented by Freight Revenues Reported by Class I Steam Railways—1939[1]

Products	Percent of freight to value at destination
Field Crops and Livestock	
Hogs, single-deck cars	4.32
Cattle and calves, single-deck cars	4.89
Calves, double-deck cars	4.94
Rice	5.63
Hogs, double-deck cars	5.71
Sheep and goats, single-deck cars	6.94
Sheep and goats, double-deck cars	8.35
Sugar beets	11.58
Wheat	12.03
Peanuts	13.54
Oats	15.14
Barley and rye	16.66
Corn	16.77
Processed Foods	
Cereal food preparations	3.23
Cheese	4.21
Cured, dried and smoked meats	4.59
Canned foods	4.74
Fresh meats	5.03
Table sirups and edible molasses	5.17
Other edible packing-house products	6.32
Dried or evaporated fruits	7.02
Sugar (beet and cane combined)	7.61
Wheat flour	8.01
Corn meal	10.03
Other flour or meal	10.27
Dried vegetables	24.67
Fresh Fruits and Vegetables	
Fresh berries	11.68
Oranges and grapefruit	14.73
Fresh apples	29.17
Fresh peaches	29.55
White potatoes	32.15
Citrus fruits other than orange and grapefruit	32.25
Miscellaneous fresh vegetables	38.36
Miscellaneous fresh domestic vegetables	39.58
Onions	42.30
Cantaloupe and melons	48.31
Cabbage	49.37
Tomatoes	50.26
Watermelons	59.66
Fresh grapes	62.41

[1] Freight Revenue and Value of Commodities Transported on Class 1 Steam Railways — 1939.

Some givers of allowances regard the practice as a cheap and effective method of advertising their products to consumers in the local press, particularly because it has the backing of local merchants. Some recipients of allowances also hold this view, but wholehearted approval is not unanimous even among recipients. The practice is quite generally condemned among dealers who have been unable to obtain allowances, and many manufacturers condemn it both on economic and legal grounds.

Historically the practice usually is started on a relatively small scale by owners of widely advertised brands who give allowances to some, but not all, merchant customers, those chosen in the food line being mainly well-known large distributors, such as chain stores and supermarkets, to whom are given allowances varying with quantities purchased. Throughout its development the practice has been characterized by the giving of allowances only to selected retailers. As the news spreads, merchants who receive no allowances demand them from manufacturers who give them, and merchants who receive allowances from some manufacturers demand them from others who do not give them.

The pressure is characterized by both manufacturers and dealers as strong, with merchants demanding allowances and, in some instances, refusing to buy if discounts are not given. Some trade members characterize the practice as a competitive device to purchase dealer support. It tends to get entirely out of control when all or nearly all competing manufacturers give allowances, with the result that manufacturers' expenses are increased without corresponding increase in volume and manufacturers' prices tend to be maintained at high levels or may even be forced upward. And nobody benefits except the dealers receiving allowances, whose larger display advertising may divert trade from their competitors who receive no allowances.

Another competitive sales promotion practice which has developed, particularly in the bread baking industry, is that of consignment selling. Prior to the time this was prohibited as a war economy measure, it saddled the baking industry with excessive losses from so-called stale returns, part of which were sold for human consumption at low prices or given away and part of which were destroyed or sold at low prices for animal food. As a war economy measure, the industry attempted to reduce the percentage of stale returns, and there was a consider-

able reduction between 1941 and 1942. However, in the fall of 1942, the quantity of bread destroyed or sold not for human consumption was sufficient to feed the population of the State of South Carolina for a period of one year.

Concentration in Food Lines

In the biscuit and cracker industry in 1939, four companies sold 77.05 percent of the total sales of the industry.

From 1909 to 1939, the number of merchant flour mills decreased 81.6 percent, but they produced 4.5 percent more flour and the average volume per mill increased 470 percent. The three largest milling companies produce about 30 percent of the country's total output of wheat flour.

In the packaged cereal industry in 1939, 70 establishments in the United States were primarily engaged in the manufacture of cereal preparations. Twenty-five companies reporting to the Commission produced about three-fourths of the total for the country. One of the 25 sold over 46 percent of the total reported by the Bureau of the Census.

Cane sugar refining is concentrated principally in the hands of a few large companies with refineries at important ports of entry. Seven cane sugar refining companies, reporting in the Corporation Reports project for 1939, sold 71.5 percent of the total reported by the Bureau of the Census.

Beet sugar is manufactured by a larger number of smaller companies with factories located inland in the areas where sugar beets are produced. In 1939, the Bureau of the Census obtained data from 85 establishments manufacturing beet sugar with a total value of product of $134,396,000. Five beet sugar companies which reported to the Commission, in connection with its Corporation Reports project, had total sales of nearly $104,000,000, or over 77 percent of the total value reported by the Census.

Fruit and vegetables are canned by a large number of plants which are widely distributed throughout the country. However, ten companies reporting under the Commission's Corporation Reports project sold 45 percent of the total 1939 value of product of the industry as reported by the Bureau of the Census. Sales in 1939, of canned vegetables, fruits and juices, by 93 companies reporting to the Commission as to their methods and costs of distribution, amounted to about 37 percent of the Bureau of the Census total.

In 1918, the Commission found that five large wholesale meat packers slaughtered from 61 to 86 percent of the principal kinds of meat animals butchered by packers engaged in interstate commerce. Their monopolistic position was strengthened by ownership of 91.6 percent of all beef refrigerator railway cars. In 1939, four companies reported sales amounting to nearly 67 percent of the total value of product for the meat packing industry as reported by the Bureau of the Census.

A fairly recent development in the wholesale baking industry has been the acquisition by four companies of numerous baking plants each serving its own local market. In 1939, the largest four wholesale bread baking companies reported combined sales of 171 million dollars, representing 44.4 percent of the total sales of 384.7 million dollars reported by the Bureau of the Census for strictly wholesale bakeries in 1939.

In dairy products, the progress of development has been away from the manufacture of milk products and the distribution of fluid milk by many small independent producers and toward the concentration of the industry's different branches under the control of a few large companies. Two of these companies, National Dairy Products Corp. and The Borden Co., both combine in their operation the manufacture of long lines of milk products and the distribution of fluid milk and cream at retail. In 1939, National Dairy Products Corp., the larger of these two companies, handled 10,064,150,000 lb. of milk, representing practically 13¼ percent of the total fluid milk not consumed on farms, as reported by the United States Department of Agriculture. The combined total sales of National Dairy and Borden for 1939, amounted to $545,483,000, or 28.8 percent of the combined total value of manufactured milk products and retail sales of fluid milk by dairy stores and retail fluid milk dealers reported by the Bureau of the Census for that year.

Another type of large manufacturing organization is exemplified by concerns such as General Foods, Standard Brands and Best Foods, each of which has acquired control of the processing and marketing of diversified lines of food products. Their activities cover both the processing and the wholesale distribution of products. A somewhat similar trend toward the integration of processing and wholesale distribution is to be noted in the case of Reid Murdock and other originally "old line" food wholesalers, which have engaged in the processing of fresh fruits and vegetables to be sold under their respective brands.

Conclusions

Along with the development of large integrated processing and marketing companies on the one hand, and the growth of large chain store and independent retailers' cooperatives purchasing agents on the other, there has been a distinct narrowing of the field within which the strictly independent wholesale grocer operates. This is the natural result of the manufacturer taking over wholesale distribution at one end of the line and chain store and retail cooperative purchasing agencies taking it over at the other. These developments have resulted in low manufacturer's distribution expenses for some products, as in the case of meats. For others, as in the case of biscuits and crackers, the manufacturer's distribution expenses continue to be high.

In terms of the consumer's dollar, distribution expenses for some manufactured products have been lowered. For others, distribution still is costly, especially for some packaged goods which are distributed at wholesale by manufacturers who maintain extensive and expensive competitive selling and delivery services for limited lines of commodities that sell in small volume per delivery to retailers. For fresh fruits and vegetables, some large assembling and marketing organizations, including both private corporations and producer cooperatives, have succeeded in narrowing expenses, other than transportation, to some extent by eliminating middlemen and shortening the distribution chain. Producer cooperatives, especially, have been considerably handicapped in their efforts to establish more direct selling relations with retailers by the monopolization of limited marketing facilities by private receivers and handlers in large terminal markets.

Although simplification in channels of distribution has resulted in reductions in distribution charges, the possibility of economies have not been exhausted. For many processed foods, as well as for fresh fruits and vegetables, distribution charges, as distinguished from production and processing costs, absorb more than half of the consumer's dollar. In times of shortages, enhanced, often speculative, distributor prices and charges contribute more to the inflation of retail food prices than producer prices, especially for products that are consumed in their fresh state. The individual farmer seldom gets the benefit of high, out-of-season prices for his products because he normally must sell them at, or soon after, harvesting.

(Turn to page 135)

Progress in Shortenings Forced By Shortages

Prejudices being discarded as technologists find answers to problem of substitutes. In some instances the substitute is better than the shortening previously used. Domestic oils are replacing imported coconut oil

By GEORGE CARLIN
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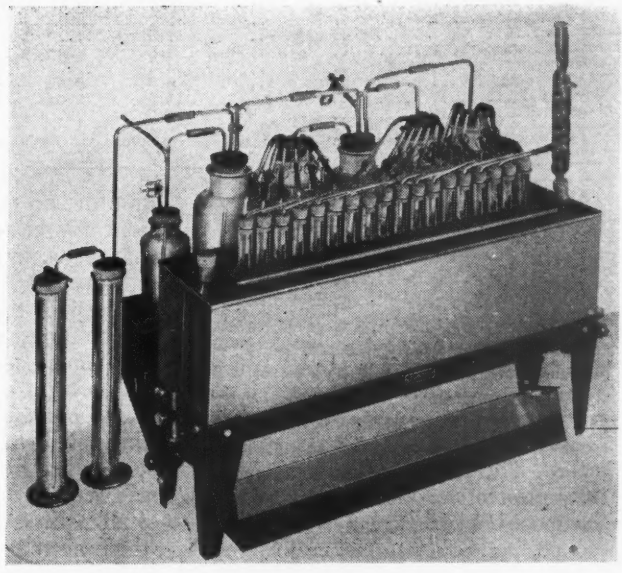


Apparatus for determining the relative keeping quality of fats and oils, information which should be had by a food processor before he substitutes one fat for another. The apparatus interprets stability in terms of the quantity of peroxides formed during exposure to accelerated oxidative conditions.

IT is fortunate that in this time of shortage our nation is not dependent upon any one specific type of fat or oil. There exists a wide degree of flexibility which offers a valuable insurance factor to the shortening producer, the soap manufacturer and the ultimate consumer. Under pressure of necessity, former prejudices concerning the respective sources of fatty materials are being discarded. Only results and performance count. Skill in the technology of fats and oils is finding practical answers to the problem of substitution for this essential materiél of war.

The perfect example of a critical shortage relieved by substitution through technological adaptation is the case of coconut oil. When the Japanese invaded the islands of the Pacific, the United States lost nearly a billion pounds of vegetable oils per year, principally coconut oil from the Dutch East Indies and the Philippines. Since nations allied with us also consumed oils from this area, an even greater demand was created for fats produced on American farms. This loss was significant not only for the quantity of fat involved, but because of the fact that coconut oil and palm kernel oil contain high percentages of lauric and myristic acids. Compared with palmitic, stearic, oleic, linoleic and linolenic acids, lauric and myristic acids have lower molecular weights which give to coconut oil specific properties that are difficult to reproduce in fats from other sources.

The low but sharp melting point of coconut oil plus its excellent resistance to deterioration are two of the characteristics that make it ideal for certain food purposes. Inasmuch as coconut oil fulfilled the requirements of food manufacture at a price that precluded much processing of other oils, little research was conducted to find substitutes before the war.

After Pearl Harbor the manufacture of candies, assorted confections, salted nutmeats, sprayed or immersed crackers, cereal specialties, cookie coatings, synthetic "cocoa butters," ice cream bar coatings, cosmetics and drug specialties was seriously threatened. Yet, within a period of a few months, research work developed replacements from fats of domestic origin. Hydrogenated peanut oil, hydrogenated cottonseed oil, hydrogenated lard products, and oleo oil-vegetable oil combinations bridged the gap with such success that few, if any, products were withdrawn from the market. With the existing knowledge and facilities of the fats and oils industry, technology has made candy lubricants, salted nut oils, spray oils, and filler and coating fats readily available from domestic oils.

Question of Interchangeability

There are only limited distinctions between animal fats and vegetable oils. Both are composed of triglycerides of the same fatty acids, varying only with the distribution of those fatty acids within the given fat and with the other fat soluble compounds which characterize them. Although the number of fats found in nature is large, triglycerides of only seven fatty acids make up the bulk of the world's supply. Table I gives the percentages of fatty acids found in the more common fats and oils.

Coconut and palm kernel oils should be excluded from Table I because of the high percentages of lauric and myristic acids which they contain. All of the other common fats—tallow, lard, olive oil, peanut oil, cottonseed oil, corn oil and soybean oil—show marked similarities in their constituents. The shortening manufacturer, by means of the hydrogenation process or by suitable blending, is further able to alter the composition of fats until it is possible to produce final products of almost identical physical and chemical characteristics from any of the above fats and oils.

Solutions to Replacement Problem

In some cases the replacement products have been found superior to their coconut oil predecessors. Ice cream bar coating, for example, when frozen, formerly hardened to a brittle texture which caused the coating to shatter into pieces when eaten. This resulted in a rather messy situation for the fastidious customer. Coating oils now made from hydrogenated peanut, cottonseed and soybean oils are "shatter proof," even after freezing. Ice cream bar coatings from these oils appear to be slated for certain postwar use.

Cookie fillings for sugar wafers and hard cookies formerly were made from specially hardened coconut oil. The type of equipment in use for the depositing of a thin layer of filling between two small cookies demanded filling-fats of highly specialized char-

TABLE I—Percentages of Fatty Acids in the More Common Fats and Oils[1]

Fat or oil	Lauric	Myristic	Palmitic	Stearic	Oleic	Linoleic	Linolenic
Coconut	45	20	5.0	3.0	6.0	....	....
Palm Kernel	55	12	6.0	4.0	10.0	....	....
Tallow (beef)	..	2	29.0	24.5	44.5	....	....
Tallow (mutton)	..	2	27.2	25.0	43.1	2.7	....
Lard	..	..	24.6	15.0	50.4	10.0	....
Olive	..	..	14.6	....	75.4	10.0	....
Arachis (peanut)	..	..	8.5	6.0	51.6	26.0	....
Cottonseed	..	..	23.4	....	31.6	45.0	....
Maize (corn)	..	..	6.0	2.0	44.0	48.0	....
Soybean	..	..	11.0	2.0	20.0	64.0	3.0
Linseed	..	3	6.0	....	....	74.0	17.0

[1] E. Webb, Oils and Fats in Soap Manufacture, *Soap Gazette and Perfumer*, Oct. 1, 1926.

TABLE II—Comparative Creaming Property of Hydrogenated Shortenings.

	Hydrogenated shortening (vegetable-oil base)	Hydrogenated shortening Meat-fat base)
Pound cake (volume in c.c.)	1,350	1,350
Creamed icing (specific gravity in gm. per c.c.)	0.785	0.730

acter. The manufacture of a satisfactory product required an almost exact balance between creaming property, congealing point and viscosity. Only slight deviations from the standard meant gummed-up machinery and production chaos. Hydrogenated meat fats, combined with lecithin, were found admirably suited for this work. Hydrogenated vegetable oils of proper type also gave satisfactory results.

Perhaps the most serious problem entailed by the coconut oil shortage was associated with the manufacture of coating for cookies. Here was a problem of most intricate nature because the peculiar "setting" properties of pressed coconut oil could not be duplicated by the domestic raw materials then available. Coatings of fairly satisfactory physical properties made from hydrogenated vegetable oils are now in use in the biscuit industry.

Frying Fats

The most important requirements of frying fat are satisfactory flavor and odor. Since all frying, particularly deep-fat frying, is conducted at rather high temperatures (340 to 380 deg. F.), any off-odor will be detected quickly. Any characteristic flavor existing in or developed by fat during frying will be absorbed by the fried food. Many of these flavors are undesirable. A new bland lard, now available in many sections of the United States, is especially valued by homemakers. This basic meat fat—lard—properly stabilized and deodorized, remains tasteless after repeated uses.

Another important requirement of frying fat is the ability of the product to maintain a high degree of stability when subjected to frying temperatures for long periods of time. This is of special significance to bakers and restaurateurs. Hydrogenation greatly improves this property. The hydrogenation of lard and its subsequent treatment to secure added stability is a relatively common practice. This results in a shortening of superior quality for deep-fat frying, pastry baking and general household use. When carefully refined, treated by hydrogenation, and deodorized, this product has a smoke point of 450 to 470 deg. F., which is higher than that which can be obtained from many other fats.

A well-known weakness of frying fats of all types is their tendency to foam when heated for prolonged periods. Refined and hydrogenated meat fats, properly stabilized, resist foaming 25 to 50 percent longer than do fats made from other raw materials. This means added hours of frying time. All of these characteristics have made refined and hydrogenated meat fats not only an accepted ingredient of frying shortenings, but in many cases the preferred ingredient.

Shortening for Cake Baking

Creaming quality in shortening is essential to the texture and symmetrical appearance of cakes. It has been established that the air spaces creamed into the fat during the cake mixing process serve as nuclei cells for expanding vapors and gases which cause the cake to rise in the oven.

In their natural state not all fats have identical creaming properties. Butter was the first cake baking fat, and cake bakers of long ago were familiar with the extreme variability in the creaming properties of butter, caused by lack of standardized methods of manufacture. Today, butter has fairly good creaming properties, provided it is handled at a suitable temperature. If creamed at 68 to 72 deg. F., it will form a stable foam structure and produce a cake of good volume, but if the creaming temperature rises to 85 deg. F. or higher, it will rapidly decline in its ability to entrap and hold air. Oils such as those from peanuts, cottenseed, soybeans, corn and olives have no creaming properties whatever in their natural state. If these oils are plasticized, either by blending with harder fats or by hydrogenation, they will develop in creaming property to a remarkably efficient degree. In fact, modern shortenings made from these raw materials will cream satisfactorily over a wide range of temperatures. This provides both the baker and homemaker with a fat which has taken nearly all of the hazards of failure out of cake baking.

Meat fats, including lard, are now being used with complete satisfaction in the manufacture of cake shortenings. Creaming properties equal in every respect to those obtained either by hydrogenation or by blending of vegetable oils can be produced from meat fat raw materials. Table II indicates the comparative creaming property of shortenings made from hydrogenated vegetable oils and hydrogenated meat fats. Pound cake serves as a yardstick because pound cake is entirely dependent upon the creaming property of the shortening for its final volume. Since the fluffiness of icings is also determined by the creaming property of shortening, creamed icing has been included in the tabulation.

From the data in Table II it is apparent that cake volume can be regulated regardless of fat selection, providing sufficient research is applied to the problem.

Keeping Quality

Present-day knowledge of antioxidants, or "stabilizers," combined with the hydrogenation process, has enabled the shortening industry to advance rapidly toward the goal of rancidity-resisting fats of all types. Gum guaiac, lecithin, inorganic acids, various organic hydroxy compounds, certain carboxylic acids and many other substances are either in use or are receiving the attention of research. Many of these substances have shown promise, and it is now apparent that suitable stability can be achieved in shortenings manufactured from widely different fat combinations. Many meat fat shortenings now on the market have excellent stability.

Nutritive Value of Shortenings

When considered strictly from a caloric standpoint, fats contribute, pound for pound, more than twice as much food value as any other food element. All fats commonly used for food purposes have been found to be 95 to 97 percent digestible.

During recent years, new nutritional factors have been discovered which seemingly exist in certain types of fat. The values which glycerides of some of the more highly unsaturated fatty acids have as special nutrient factors are becoming more and more understood. Since these unsaturated glycerides exist in many of the meat fats, their values as ingredients for shortening have been enhanced.

Analyzing Conditions In Gas-Filled Cans

Simple method for sampling and analysis of atmosphere in 5-gal. cans of dehydrated vegetables packed in carbon dioxide or nitrogen

LARGE quantities of dehydrated vegetables are being packed for the government in cans from which the air is exhausted and which are then filled with an inert gas such as carbon dioxide or nitrogen. As the keeping quality of these products depends in great part upon the effective removal of the atmospheric oxygen and its replacement by inert gas, the atmosphere in a reasonable proportion of the cans packed should be analyzed.

Commercial types of gas analysis apparatus often are not available in dehydration plants and, in any case, require an experienced technician as operator. The apparatus here described and shown can be substituted and is simple to operate. It can be assembled at little cost from standard laboratory equipment and gives results that are sufficiently accurate.

Gases normally present in these cans of dehydrated vegetables are carbon dioxide, oxygen and nitrogen. The percentages of each can be quickly determined with the proposed apparatus.

Referring to the accompanying sketch, the apparatus consists of a 300-ml. gas-collecting tube *E*, a 50-ml. Lunge nitrometer *G*, leveling bottles *F* and *H*, stopcocks, rubber tubing, clamps and stands. The puncturing device *C* is mounted on a stand on which the can to be analyzed is placed. In operation, the gas sample is collected in tube *E*, a 50-ml. portion transferred to the nitrometer *G*, and the carbon dioxide and oxygen absorbed in turn by specific reagents.

Solutions Required

Three solutions are required and are prepared as directed. Solution 1 may be used indefinitely, solutions 2 and 3 should be prepared as needed.

Solution 1—Five hundred grams of anhydrous sodium sulphate is dissolved in 2,000 ml. of water. One hundred milliliters of concentrated sulphuric acid is added, together with sufficient methyl orange indicator solution to impart a red color.

Solution 2—Carbon dioxide absorption solution. Dissolve 50 g. of potassium hydroxide in 100 ml. of water.

Solution 3—Oxygen absorption solution. Five grams of pyrogallic acid is dissolved in 100 ml. of solution 2.

Procedure

The gas-collecting tube *E* is carefully filled, prior to analysis, with solution 1. This is accomplished by filling the aspirator leveling bottle *F* and allowing the liquid to flow by gravity through the system to the puncturing device *C*. Similarly, the Lunge nitrometer *G* is filled with water by gravity flow from leveling bottle *H*. Since air bubbles trapped in the apparatus would introduce an error in the determination, care should be taken that all tubing connecting the gas-collecting tube *E* with the can-puncturing device *C* and the Lunge nitrometer *G* is completely filled with liquid.

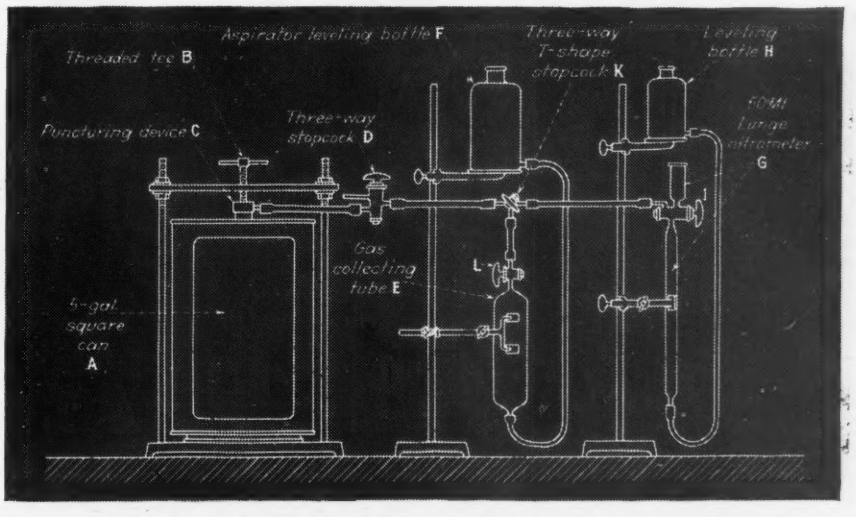
The can to be sampled is placed on the stand under the puncturing device *C*, and is punctured with all stopcocks closed. Aspirator leveling bottle *F* is lowered, stopcocks *D*, *K* and *L* are opened and about 25 ml. of gas is collected in tube *E*. Since this first portion of gas may contain air that was present in the puncturing needle, it is eliminated in an attempt to purge the line. This is accomplished by closing stopcock *D*, raising bottle *F* and then opening stopcock *D* in the reverse position and purging the gas that has been drawn into the apparatus.

The sample of gas for analysis is now taken. Stopcock *D* is closed, the leveling bottle *F* is lowered, stopcock *D* is again opened in the original position and the gas is drawn from the can into the gas collecting tube *E*. At least 150 ml. of gas should be collected. Stopcock *L* is closed, stopcock *K* is reversed to connect tube *E* with the Lunge nitrometer *G*, and the leveling bottle *F* is raised.

A 45- to 50-ml. sample of gas is removed from the collecting tube *E* to the Lunge nitrometer *G* in the following manner. Stopcock *I* is opened, leveling bottle *H* is lowered, stopcock *L* is opened, and when about 50 ml. of gas has been collected in the nitrometer *G*, stopcock *I* is closed. The initial volume reading is taken. This is done by having the stopcock on the nitrometer at the closed position and adjusting the internal pressure to the barometer pressure by means of leveling bottle *H*. After the initial reading is taken, approximately 10 to 15 ml. of solution 2 is allowed to trickle into the nitrometer by opening stopcock *I* to the proper position. When carbon dioxide contraction has taken place, the new volume is read after adjusting the pressure by means of the leveling bottle *H*. The oxygen is then removed by the addition to 10 ml. of solution 3. The final reading, reported as nitrogen, is made after adjusting pressure with the leveling bulb.

It is often desirable, when large amounts of gases are present, to repeat the addition of solutions to the nitrometer to make certain that all contraction due to absorption has taken place.

After each determination, the nitrometer *G* and leveling bottle *H* should be disconnected from the apparatus and thoroughly cleaned before starting another analysis.



Portable apparatus for analyzing atmosphere in gas-filled cans.

Cabinet Dehydraters Suited To Small-Scale Operations[1]

By E. A. BEAVENS,* Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture

PART II—Cabinet dehydraters have definite advantages for certain operations. Having described these units in Part I of his article, the author in this part discusses operating procedure and other factors in their use

IN Part I, published in January, the various types of cabinet dehydraters were described and illustrated by diagrams. In this second part, the author discusses the preparation equipment, operating procedure, finishing and packaging. Pilot-plant runs, multistage cabinet dehydraters, combination compartment and tunnel systems and the duplex cabinet system are in Part III.—THE EDITORS.

Preparation Equipment

For small batches in experimental cabinet dehydraters, hand preparation methods can be used. If several runs of 500 to 1,000 lb. are to be handled in the larger cabinets, then motor-driven preparation equipment of a semicommercial size must be used. Equipment will be needed for washing, peeling, coring, trimming, slicing, dicing, blanching and packaging. These preparation steps should be carried out with suitable mechanical equipment free from contact with copper, rusty iron or other corrodible metals which tend to destroy vitamins, color and flavor in fruit and vegetable products. The various pieces of preparation, dehydration and packing equipment should be set up as a straight-line process to carry out the several operations in the quickest possible time and in the most efficient manner.

Operating Procedure

In general, the following procedure may be used for the operation of a single cabinet dehydrater. Fresh vegetables of good quality are prepared and steam blanched according to standard blanching schedules. For the small batch operations, a cabinet-type steam blancher connected to a 20- to 25-hp. boiler can be used conveniently. (If the cabinet dehydrater is to be heated by a steam coil, then a much larger boiler or steam supply will be needed to carry out both operations.) Two to four loaded trays are slid into the blancher, one above the other, on supports made from pieces of perforated steam pipe, all connected to the steam supply. Larger cabinets can also be used if more steam is available. After loading, the steam is turned on and the blanching time started after the temperature around the trays has reached 200 to 205 deg. F. For larger cabinets operating continuously, a belt-type, continuous blancher would be desirable. During the blanching operation, it is a good practice to preheat the cabinet to cut down on the time required for the temperature to regain its maximum point after loading.

One or more trucks of trays loaded with the prepared and blanched vegetables, or individual trays in the small units, are pushed into the cabinet dehydrater and the timing of the process is started after the temperature has reached the desired point. The capacity of the heating unit should be large enough to hold the temperature at the desired point without too much of a lag when the load of wet vegetables is placed in the cabinet.

The proper adjustment of the air intake-exhaust damper is a matter of actual experience with a particular type of cabinet dehydrater, with the products to be dried and with varying atmospheric conditions. In most cases, it will be necessary to close both dampers at the start, to allow the temperature to reach the maximum point as quickly as possible after loading. Both dampers should then be opened wide to give a high rate of fresh-air

Outside installation of a cabinet dehydrater, with unit heater on top. The cabinet is of wooden frame and cement asbestos board construction.

[1] Bureau Publication. No. O.P. 4061.

* Laboratory of Fruit and Vegetable Chemistry, 148 South Mission Road, Los Angeles 33, Calif. Further information on designs of dehydrators discussed here can be obtained from this laboratory or from the Western Regional Research Laboratory, Albany 6, Calif.

intake to exhaust the water vapor as rapidly as possible. A high wet-bulb depression (difference between dry- and wet-bulb readings) is maintained to dry the product in the shortest time. The rate of drying at the beginning will be very rapid because of such factors as high rate of water evaporation, large air circulation, high initial drying temperature and high wet-bulb depression. As drying progresses, the rapid evaporation of water is materially reduced, being replaced for the most part by a slow diffusion process. When this takes place, less heat and air circulation are required, and the dampers can be partly closed to increase the recirculation of the air, thus saving considerable fuel. As the dampers are closed, the dry-bulb temperature must also be lowered in scheduled steps and the drying completed at lower temperatures to prevent scorching.

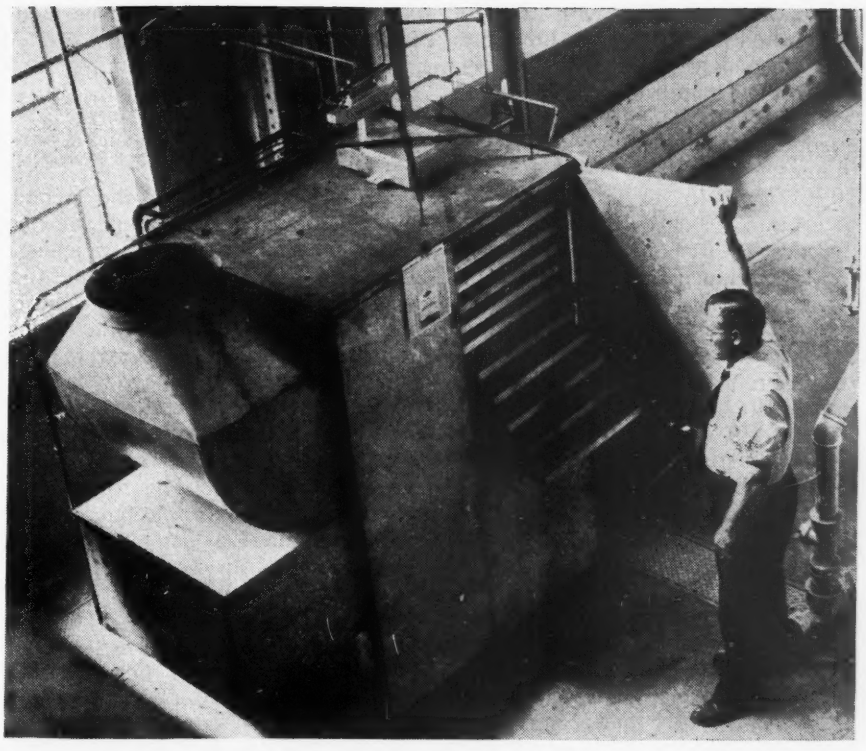
In general, temperatures of 155 to 175 deg. F. are ordinarily recommended for most products, but recent experiments have indicated that initial temperatures as high as 190 to 200 deg. F. can be used on many products for the first 30 to 60 minutes, provided the air velocity is over 600 ft. per minute.

These high initial drying temperatures can be used under carefully controlled conditions. During the early drying stages, the high moisture content of the wet vegetables causes a rapid rate of evaporation. This has a marked cooling effect on the product, and the actual temperature of the wet material is approximately the same as the wet-bulb temperature, which is considerably lower than the dry-bulb temperature. As drying progresses, the rate of evaporation slows down, thus reducing the cooling effect, and the temperature of the drying material gradually approaches the dry-bulb temperature. The high initial drying temperatures are then lowered to finishing temperatures of 120 to 170 deg. F.

Determinations on the vitamin C (ascorbic acid) content of vegetables have indicated that more of this vitamin is retained in those samples dehydrated at high initial temperatures in the shortest time than in those samples dehydrated at moderate temperatures for a longer time.

Determination of Optimum Dehydrating Temperatures

A schedule of optimum dehydrating temperatures should be worked out for each product to give the highest rate of drying without injury to the product, and these schedules should be followed closely to obtain uniform quality and color. A suggested procedure for setting up time schedules for the cabinet drying of vegetables follows:* The cabinet is loaded with the prepared vegetables and dehydration started at the initial dry- and wet-bulb temperatures for any given vegetable as listed in Table I. As drying progresses, these temperatures are lowered by steps until the desired finishing temperatures are reached. The temperature changes are made on the basis of a time schedule previously determined by a pilot run in which the temperatures are lowered in steps as the moisture content of the product is lowered. This can be done only if such conditions as air flow, tray loading and shape and size of the pieces are fixed.



Cabinet dryer used for pilot-plant operations. A scale is mounted on top of the cabinet in such a manner that the vegetables can be weighed as drying progresses to determine the approximate moisture content.

Since it is usually impracticable to determine the moisture content of the product during the drying period, changes in moisture content can be roughly estimated by following the weight loss in one or more trays, obtained by weighing at frequent intervals. The temperature changes are made when the reduction in weight reaches certain values determined by multiplying the estimated dry weight of the product by the factors indicated in Table I for each product. On this basis at least two pilot runs are required to establish a time schedule for temperature changes.

The first pilot run is required to obtain an estimate of the amount of water lost from the product during dehydration or, conversely, the yield of dry product from prepared. This is accomplished by loading the dryer with prepared material, recording the weight of prepared material on one or more trays, drying under constant temperature conditions at or near those suggested as finishing temperatures for the product, and recording the weight and percent yield of dry product.

For example, suppose that the cabinet dryer has a capacity of 1,000 lb. of prepared potatoes and that it is provided with three trays that can be removed readily for weighing. One of the trays is located half-way between the top and middle, one in the middle, and one half-way between middle and bottom of the tray stack. Suppose that when the cabinet is fully loaded it is found that the net weight of product on each of the weighing trays is 20 lb., and that after dehydration at 150 deg. F. dry bulb and 90 deg. F. wet bulb, the average weight of dry product on each of the trays is 4.2 lb. Then the yield of dry products equals.

$$\frac{4.2}{20} \times 100, \text{ or } 21 \text{ percent}$$

The second pilot run is made to determine the time schedule for reducing the temperature during the regular run and is carried out as indicated in the following example:

* The procedure for determining dehydration time schedules and the discussion of pilot runs was contributed by Horace Campbell and W. B. Van Arsdel of the Western Regional Research Laboratory at Albany, Calif.

The cabinet is loaded with 1,000 lb. of prepared potatoes. The three trays mentioned above are each loaded with 20 lb. of raw material. In the first pilot run it was determined that the yield of dried potatoes was 21 percent, so that from each of the trays a yield of 0.21 x 20 lb., or 4.2 lb., of dry material may be expected. Dehydration is started at 200 deg. F. dry-bulb and 120 deg. F. wet-bulb temperature. At frequent intervals, the trays are weighed. When the average weight per tray (corrected for weight of tray) drops from 20 lb. to three times the expected dry weight, or 12.6 lb. ($3 \times 4.2 = 12.6$), the time for this drop in weight is recorded and the temperatures dropped to 170 deg. F. dry-bulb and 105 deg. F. wet-bulb, as indicated in Table I. When the average weight per tray is reduced from 12.6 lb. to two times the expected dry weight, or 8.4 lb. ($2 \times 4.2 = 8.4$), the time for this drop in weight is recorded and the temperature dropped to 155 deg. F. dry-bulb and 95 deg. F. wet-bulb, as indicated in Table I. The time required for the weight of the product to be reduced from 8.4 to 1½ times the expected dry weight, or 6.3 lb. ($1.5 \times 4.2 = 6.3$), is recorded, and in accordance with Table I the dry- and wet-bulb temperatures are lowered to 150 deg. F. and 90 deg. F. in the order named. Dehydration is then continued at these temperatures until complete.

Suppose that the second pilot run gave the following results:

Average weight reduction (pounds)	Time required (minutes)
20 to 12.6	42
12.6 to 8.4	33
8.4 to 6.3	25
6.3 to completion	250

The time schedule for temperature change indicated would then be used in the regular run as follows:

Time after start (minutes	Temperature drop Dry bulb, deg. F.	Wet bulb, deg. F.
42	200 to 170	120 to 105
75	170 to 155	105 to 95
100	155 to 150	95 to 90

During the course of the second pilot run the product should be observed for scorching at each weighing. If scorching occurs, it will enable the operator to make intelligent adjustment in temperature in other pilot runs, which will be necessary to find suitable conditions.

For example, suppose that in the dehydration of potatoes, it was observed that scorching occurred within 42 minutes from the start. This would indicate that the first break in temperature should be made sooner. Accordingly, another pilot run would bet set up where the first break in temperature would be made, say at the end of 20 minutes, from 200 to 185 deg. F., and then at the end of 42 minutes from 185 to 170 deg. F. On the other hand, suppose that it was observed that scorching occurred in the time range from 100 minutes to completion of drying; then another pilot run would be set up in which a lower finishing temperature, say 145 deg., would be used.

Because of lack of complete knowledge concerning the cabinet drying of vegetables, it is difficult to set up systems of temperature change to be followed in the course of dehydration that will be absolutely correct. Each operator must depend upon the method of trial and error to arrive at the proper conditions. The discussion given herein is offered for the purpose of furnishing the operator with a starting point for the trial-and-error investigations. It should be remembered that the conditions suggested may not in all cases give the best results.

Finishing and Packaging

During the dehydration process, the largest percentage of water is removed from the product during the first one to two hours, and the remaining 10 to 15 percent is the hardest to remove. Drying must be continued until the final moisture content has been reduced to 7 percent or less, depending on the vegetable. In cases where it is desired to run one batch of vegetables in the cabinet dryer, the product may be held at the proper finishing temperature until it has been uniformly dried to the desired moisture content. This practice is somewhat costly, since the cabinet must be kept under full operating conditions to remove such a small amount of water. Either of two methods can be used to equalize the moisture content to 7 percent or less. If a single batch of material is dried each day, the simplest method would be to leave the material on the trays in the cabinet and equalize overnight by lowering the temperature to 120 to 125 deg. F. and reducing the speed of the circulating fan. If several batches of the same material are run during the day, the contents of the trays can be piled on fewer trays at the end of the run, returned to the cabinet, and equalized overnight as suggested above. When one or more cabinets are operated continuously, an equalizing bin of suitable capacity will be necessary. After the moisture content of the product has been reduced to 10 to 12 percent at the finishing temperature,

(*Turn to page* 134)

TABLE I—Suggested Dry- and Wet-bulb Temperature Changes for Cabinet Dehydration Pilot Run No. 2

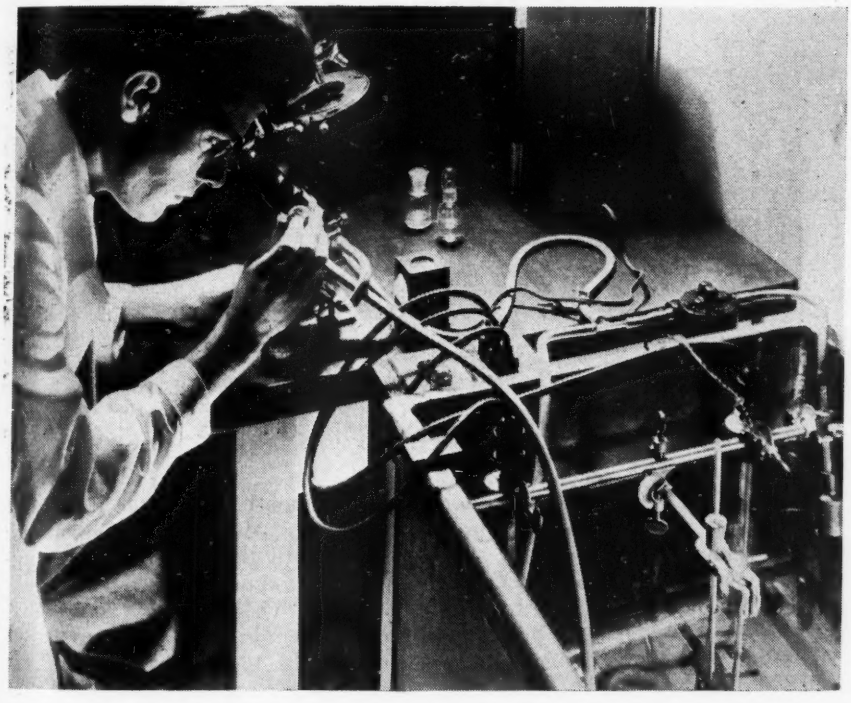
Vegetable	Original weight reduced to times dry weight*	Dry-bulb temp. drop, deg. F.	Wet-bulb temp. drop, deg. F.
Irish potatoes	3	200 to 170	120 to 105
	2	170 to 155	105 to 95
	1.5	155 to 150	95 to 90
		150	90
Sweet potatoes	4	200 to 175	120 to 110
	3	175 to 170	110 to 105
	2	170 to 160	105 to 95
		160	95
Onions	6	165 to 155	100 to 95
	4	155 to 145	95 to 90
	3	145 to 140	90 to 85
	2	140 to 130	85 to 80
		130	80
Carrots	4	200 to 180	120 to 110
	3	180 to 160	110 to 100
	2	160 to 155	100 to 90
		155	90
Rutabagas	4	200 to 180	120 to 110
	3	180 to 160	110 to 100
	2	160 to 150	100 to 90
		150	90
Beets	4	200 to 175	120 to 110
	3	175 to 155	110 to 105
	2	155 to 150	105 to 90
		150	90
Cabbage	6	165 to 160	100 to 95
	4	160 to 150	95 to 90
	3	150 to 140	90 to 85
	2	140 to 135	85 to 80
		135	80
Celery	6	165 to 155	100 to 95
	4	155 to 150	95 to 90
	3	150 to 135	90 to 85
	2	135 to 125	85 to 80
		125	80
Spinach	3	200 to 185	120 to 115
	2	185 to 180	115 to 110
	1.5	180 to 170	110 to 100
		170	100
Tomatoes	3	200 to 175	120 to 110
	2	175 to 150	110 to 90
		150	90
Sweet corn	3	180 to 170	110 to 105
	2	170 to 165	105 to 95
		165	95
Snap beans	3	180 to 165	110 to 100
	2	165 to 155	100 to 95
	1.5	155 to 150	95 to 90
		150	90
Peas	3	180 to 160	110 to 100
	2	160 to 155	100 to 95
	1.5	155 to 150	95 to 90
		150	90
Lima beans	3	180 to 160	110 to 100
	2	160 to 150	100 to 90
		150	90
Parsnips	3	200 to 175	120 to 110
	2	175 to 165	110 to 100
	1.5	165 to 160	100 to 95
		160	95

* Dry weight = expected dry weight as determined in first pilot run.

Better Technics Recommended For Determining Citrus Solids

By J. B. HARKER and G. MANLEY COLE, The Exchange Lemon Products Co., Corona, Calif.

Total solids content of citrus juices must be determined on concentrates for spray drying, to meet product specifications. A refractometer test, or a low temperature for the vacuum drying method, gives best results



A refractometer, which permits solids determinations on highly concentrated, viscous or pulpy juices, and requires only a small sample for test, is recommended for determining total solids in highly acid citrus juices.

RECENT large-scale manufacture of spray-dried lemon juice powder, largely for incorporation into the "Lemon Juice Powder—Synthetic" which has been a component of the Army K-ration, has occasioned a greatly increased interest on the part of juice purchasers and processors in the determination of solids contents of the juices or concentrates taken for spray drying. Because specifications for such powders call for a stated minimum of actual lemon juice solids, it is imperative that advance knowledge be had of the total solids contents of the juices or concentrates used.

Furthermore, certain mechanical losses of finished powder attend the actual spray drying of the juice-glucose sirup mixtures fed to the dryers. Such losses are not readily determinable, so that there has been a practical need for accurate solids content values for the juices employed. Those values are needed for calculating theoretical yields.

It has been general practice in the citrus juice, concentrate and beverage industries to employ a Brix hydrometer reading as an approximate value for the soluble solids content. Since the suspended insoluble solids in such products normally amount to less than about 1 percent, the Brix figures have also been taken as representing roughly the total solids values. This general use of Brix values is, of course, not strictly proper and has occasioned much confusion and many errors. A Brix spindle reading is not a true Brix value and does not truly indicate percent soluble solids, except as applied to solutions of sucrose in pure water.

Corrections Required

More recently, since the publication of the work of Stevens and Baier [1], cognizance has been taken of the fact that the Brix spindle reading on a citrus product must be corrected for citric acid content to arrive at a close value for true soluble solids. In the same article these workers indicated the corrections to be applied to sugar-scale refractometer readings on citrus juices to convert these readings to Brix spindle readings or to the true soluble-solids values. The latter are now referred to in the trade quite commonly as "corrected Brix values."

The refractometer method is the one to be used whenever the juice product is too highly concentrated, viscous or pulpy in nature, or the sample too small in volume, to permit taking Brix spindle readings with any degree of accuracy.

The manufacturers of dried juice products were the first users of citrus juices definitely to be concerned about the total solids values, as distinguished from the true soluble solids values which concern the beverage industry. The desire for actual total solids content figures prompted resort to an actual drying procedure to determine total solids.

Several laboratories already have encountered difficulties in attempting to employ an official vacuum drying procedure [2] recommended for determination of total solids "in massecuites, molasses and other liquid and semi-liquid products."

In two instances which have come to our attention, the samples were of concentrated lemon juice of about 50 deg. Brix, so-called, and in both cases the results were lower than the true soluble solids values obtained by the refractometric procedure of Stevens and Baier.

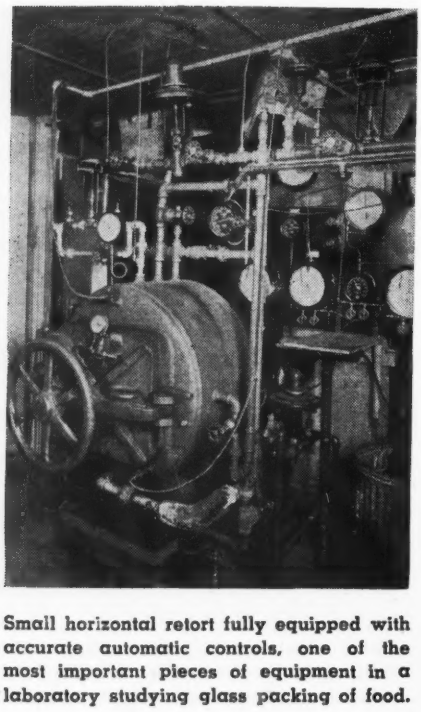
Suggested Modifications

Vacuum drying at 70 deg. C. (158 deg. F.) is recommended in all of the Association of Official Agricultural Chemists drying methods that appear

(Turn to page 151)

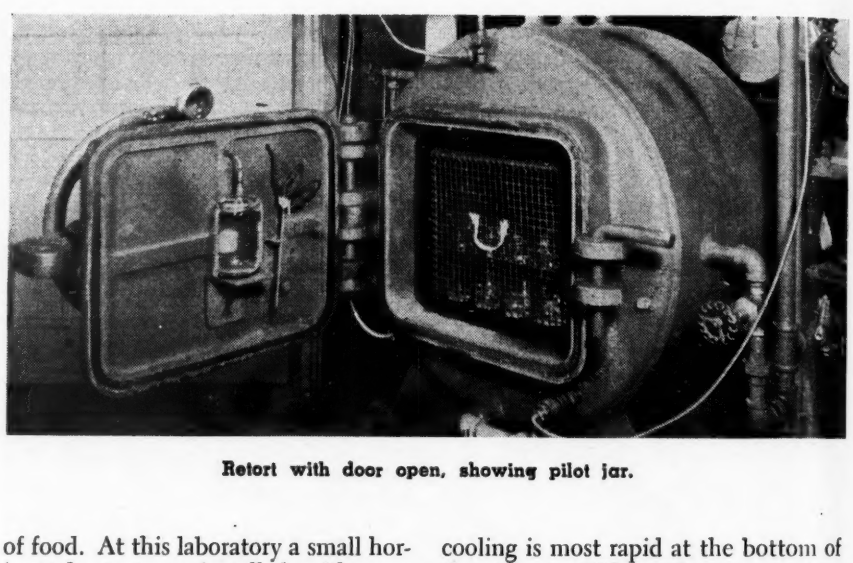
New Methods Devised To Solve Glass-Pack Problems

Food processing laboratory not only equips retort with complete set of accurate automatic controls, but works out ways of measuring headspace pressure and determining vacuum in all-glass jars. Heat penetration measured



Small horizontal retort fully equipped with accurate automatic controls, one of the most important pieces of equipment in a laboratory studying glass packing of food.

By FRANK YOURGA
Hartford-Empire Co., Hartford, Conn.



Retort with door open, showing pilot jar.

WARTIME shortages of critical materials are testing the ingenuity of the food container industry. Food packers have asked glass container manufacturers to supply them with a 100 percent noncritical container that will be attractive, inexpensive and will stand the abuse incident to high-speed production methods. To understand the basic problems involved in meeting this request, Hartford-Empire engineers and chemists have gone to many large food packing plants to study just what is required of a glass container. These studies have resulted in the design and construction of new glass-handling machinery[1] and a new all-glass "noncritical" container.[2]

An important factor in making possible the new all-glass container has been the food laboratory established by Hartford-Empire in 1942. The laboratory is equipped with the machinery and apparatus necessary for a thorough investigation of the problems connected with the processing of glass-packed foods.

A processing retort is one of the most important pieces of equipment in a laboratory studying the glass packing of food. At this laboratory a small horizontal retort was installed, with pressure and temperature controls. Figure 1 shows schematically the retort and its piping, valves and controls. In this retort a wide range of processing conditions may be accurately established and maintained. Pressures ranging from 1 to 40 lb. of steam, air or water can be maintained during a process period with a fluctuation of less than ½ lb. Temperatures ranging from 100 to 300 deg. F. can be obtained with a fluctuation of less than 1 deg. from a set value. The range and stability of retort temperatures and pressures were made possible by the use of air-operated Foxboro controls on the air, steam, water and relief valves.

Retort temperature is maintained by an open-and-shut controller 1, which regulates the flow of steam into the retort. The steam inlet in the bottom of the retort is fitted with two ejectors which draw air from the top of the retort and mix it with the entering steam. This air, entering with the steam, creates a turbulence in the retort and insures an even distribution of heat. The temperature control bulb is located near the bottom of the retort. This affords the most accurate control for glass processing because cooling is most rapid at the bottom of the retort. When the temperature drops slightly the control responds immediately to raise it again.

A study of Fig. 1 will show that steam can also be made to enter through the top of the retort. This feature is present for experimental purposes and is seldom found on commercial retorts.

Retort Pressure Control

Retort pressure during processing is maintained by pressure controls 2 and 3 on the air inlet and relief valves, respectively. For the purpose of illustration, let us assume that a pressure of 30 lb. is desired during processing. The air control, an open-and-shut-type, is set for 30 lb. and keeps the air valve open until the set pressure is attained. It then closes tight and remains closed until the retort pressure drops slightly below the desired pressure. Pressures over 30 lb. are corrected by a proportional or throttling type controller regulating the relief valve. The stability of retort pressure is due largely to this controller because it opens the relief valve only to the degree necessary to relieve the excess pressure. If both pressure controllers were of the open-and-shut type, a fluctuation of 1 or 2

[1] *Glass Packer*, February, 1943.
[2] *Glass Packer*, June, 1943; *Glass Industry*, July, 1943.

lb. above and below the set pressure would result. By the use of a proportional-type controller on the relief valve the retort pressure holds steady at 30 lb. Figure 1 shows the air inlet located at the top of the retort and pressure vents located at the top and side of the retort. Pressure gages 7 and 8 indicate motor pressure and air-supply pressure in the automatic instruments.

Cooling Carefully Controlled

The cooling of a retort containing glass must be done with reasonable care. This is accomplished in the laboratory retort by accurate control of the cooling water with a Foxboro remote controller. When a cooling procedure has been standardized by experimentation, it can be duplicated readily after each process by the use of this controller. The instrument as used on the retort is essentially a means of controlling the volume of cooling water entering the retort. While the retort is being cooled, the retort pressure is controlled by the relief valve.

For the purpose of determining temperatures at various points in the retort there are three indicating thermometers, as shown in Fig. 1, in addition to the recording temperature controller. A fifth thermometer has its bulb located in the water line to check the temperature of water that is to be fed into the retort. Hot and cold water can be mixed in the supply line until the desired temperature is obtained. While the temperature is being adjusted, the water is bypassed to a drain rather than being directed through the retort.

Headspace Pressure During Processing

An important feature of the retort is the setup for determining the internal pressures developed in glass jars during processing. A vacuum-pressure gage on the door of the retort is connected by capillary tubing to a pilot jar mounted on the inner side of the door. Figure 2 shows the pilot jar and its connections. During processing, the pilot jar is subjected to the same retort conditions as the regular jars and therefore develops the same internal pressure. Since the jars are usually vacuum packed, a vacuum must be created in the pilot jar to make conditions identical. This is done by opening a valve in the gage line of the pilot jar and pumping air out until gage 5, Fig. 1, reads the desired inches of vacuum. The pilot jar has proved to be very useful because it made relatively simple an extensive study of internal pressure developed within glass jars during processing.

Heat-penetration Apparatus

In a study of food processing the rate of heat penetration in a food container is of great importance. In this retort, temperatures with a test jar are

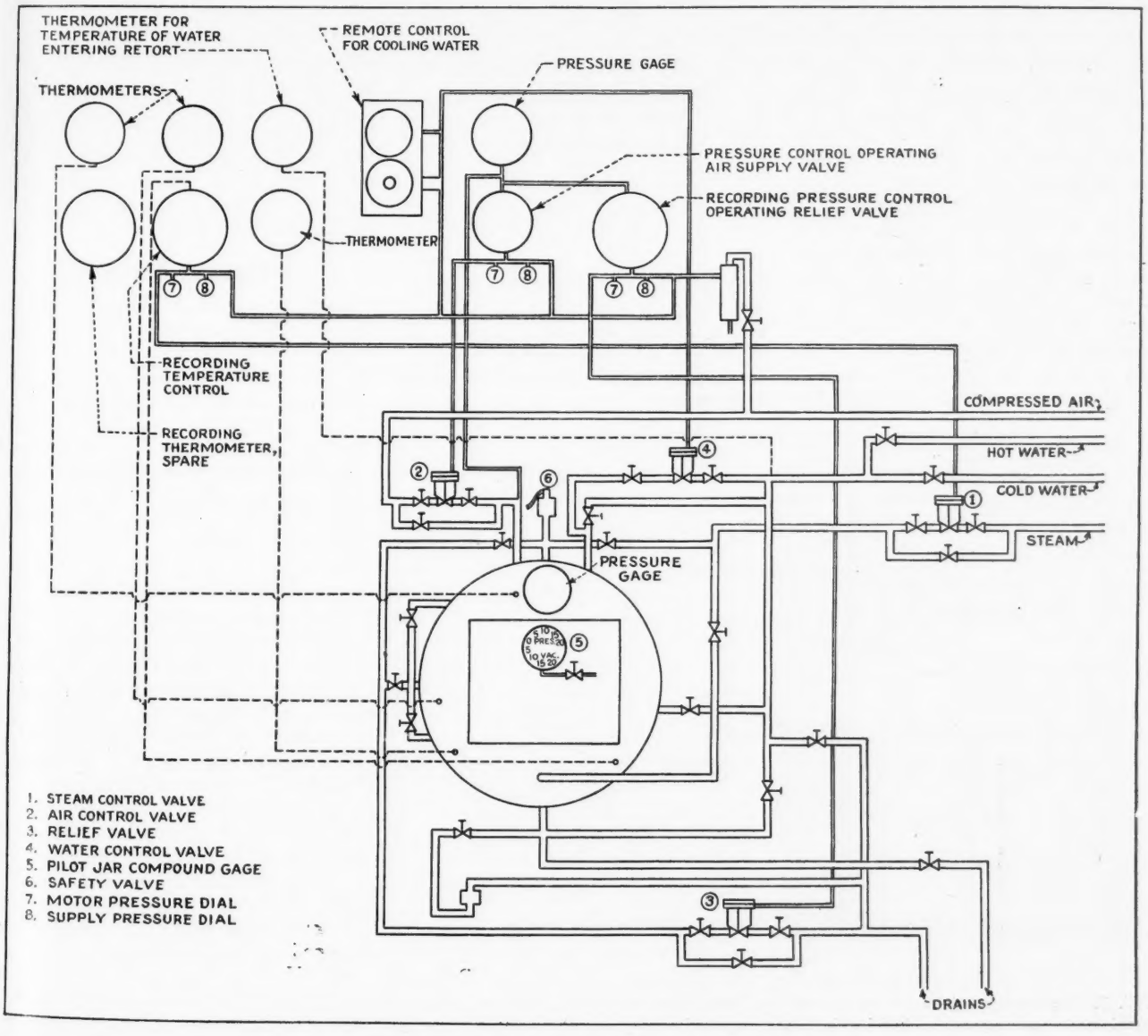


FIG. 1. Schematic diagram of retort and its piping, valves and controls.

determined by a copper-constantin thermocouple inserted centrally into the food. The thermocouple wires are led from the test jar through a gland in the retort door to a Leeds and Northrop potentiometer-indicator.

Vacuum-testing Apparatus

Several methods have been developed in this laboratory to determine the vacuum in all-glass containers, on which a puncture gage cannot be used. One method makes use of the water-hammer effect found in vacuumized jars containing a liquid. The test jar is held in the left hand and the base of the jar is struck with the palm of the right hand. The blow causes a water hammer in the jar which results in a loud metallic click. The resulting sound is characteristic of the specific degree of vacuum existent in the jar. After a little practice with jars of known vacuum, a tester can judge the degree of vacuum with reasonable accuracy. This method is intended to serve only as a quick approximation where it is not necessary to know the exact vacuum.

The second method involves the use of a White bell-type vacuum sealer. The test jar is immersed in a beaker of water placed in the bell chamber of the sealing machine. A vacuum is then slowly drawn on the chamber and the degree of vacuum is noted on the chamber gage when bubbles of air begin to escape from the test jar. Theoretically the bubbles appear when the degree of vacuum in the chamber is only infinitesimally greater than in the test jar and therefore the vacuum of the chamber is practically that of the test jar. Actually, however, the vacuum in the chamber has to be several inches greater than in the test jar to cause venting. This is due to the gripping of the gasket on the jar and cap. Working with known vacua, however, the extent of this effect has been determined for gaskets made of different materials. The degree of wetness of the gaskets and the temperature at which the jars were processed also affect the gripping action of gaskets. To obtain the actual internal vacuum, appropriate corrections are made on the gage reading. This vacuum-chamber method has proved a rapid and accurate means of determining vacua in all-glass jars and is the method generally used in this laboratory

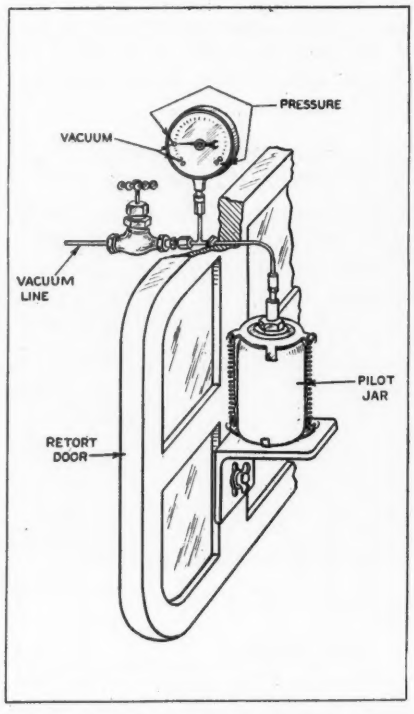


FIG. 2. A pilot jar mounted inside the retort door is used to determine the internal pressure developed in glass jars during processing.

When a jar has a very high vacuum (close to 29 in.) and when the gasket adds greatly to the force needed to lift the cap, the vacuum-chamber method cannot be used. To test jars under such conditions, an instrument called the "pry-off" has been devised. Figure 3 shows the apparatus set up on an all-glass jar. It is essentially a simple lever arrangement whereby the force necessary to pry off a cap indicates the inches of vacuum in the receptacle. One end of this lever hooks under the jar cap and the other end supports a receptacle into which water is added at an even rate until the cap is pried off. The weight of the water needed to pry off the cap is an index to the vacuum in the jar. Jars in which specific vacua have been created were used to determine the relationship between pry-off weights and vacua. As in the vacuum-chamber method, a correction has to be made for the gripping effect of the gaskets. For rapid interpretation of pry-off weights, a reference curve was plotted with the data from the standardization experiment.

Incubator and Refrigerator

Large temperature changes during storage often bring to light defects in food containers and closures. In the food laboratory glass-packed foods are alternately stored in a large refrigerator at 40 deg. F. and an incubator at 98 deg. F. Chemical, physical and bacteriological changes brought about in the food containers by these storage conditions are noted and means of preventing them are sought.

Research Carried On

With the use of the above equipment, extensive research has been carried out on problems relating to food processing. Gasket testing methods have been developed, and gaskets made of rubber substitutes and synthetic rubbers have been evaluated. A critical study has been made of initial vacuum, fill temperature and jar headspace in regard to their effect upon internal jar pressures at process temperatures.

The laboratory also proved an invaluable aid in determining the design for the new all-glass container recently announced by Hartford-Empire.

The Hartford-Empire Company will gladly cooperate with food packers in solving problems in packaging products in glass.

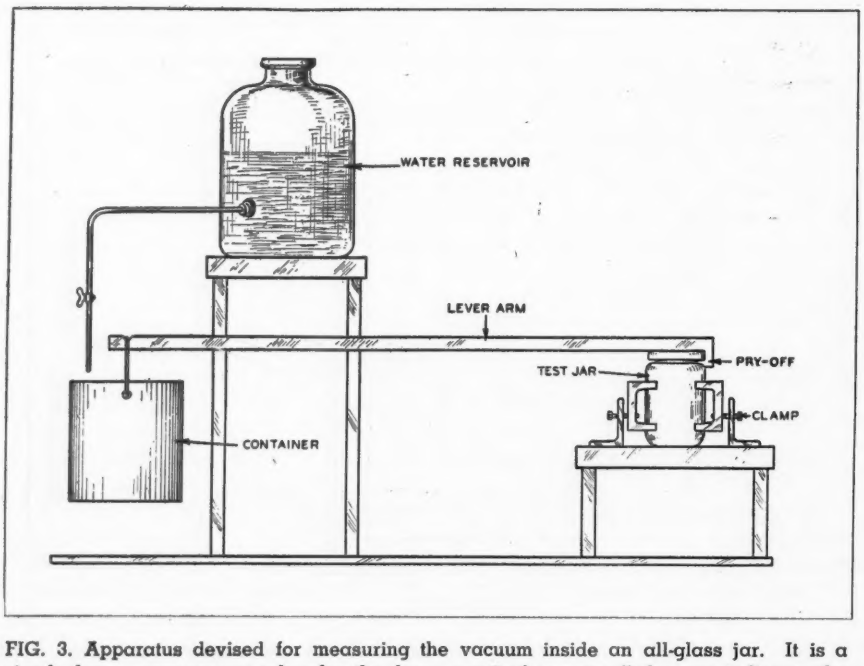
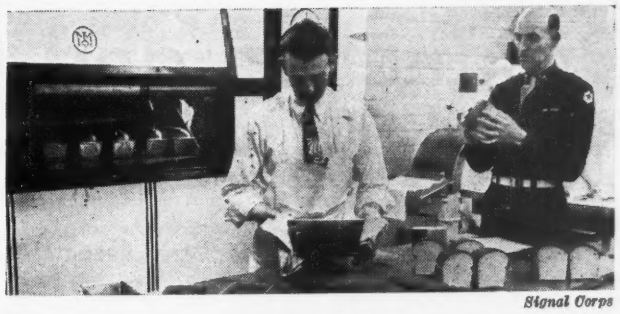


FIG. 3. Apparatus devised for measuring the vacuum inside an all-glass jar. It is a simple lever arrangement whereby the force required to pry off the cap indicates the vacuum in the jar.

Signal Corps

Shown in conference room of new QMC laboratory are (left to right) Capt. W. A. Maclinn, Capt. C. M. Wilson, Col. R. A. Isker, Maj. R. R. Melson and Maj. Don L. Deane.

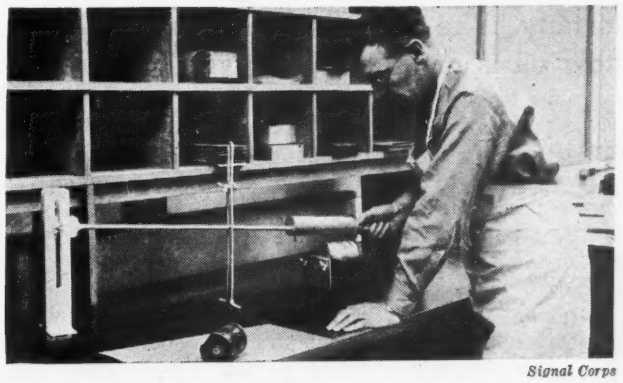


Signal Corps

Army enriched bread undergoes baking test. W. F. Schlack, assistant civilian technologist, removes the bread from the oven while Lt. O. N. Tucker inspects the loaves.

Signal Corps

Capt. M. E. Highlands (right) in charge of the processed fruits and vegetables branch, and his assistant, Lt. Jules Novick, inspect a tray of dehydrated carrots.



Signal Corps

Major James d'A Clark tests a commercial can of evaporated milk. The can probably will be cut open at one blow. At left is a special can which held up under 50 blows.

QMC Opens New Laboratory

Dedicated enlarged subsistence research facilities on January 8. Laboratory is specially equipped

THE new and greatly enlarged Subsistence Research Laboratory of the Army's Quartermaster Corps was opened with two days of appropriate ceremonies that ended with the dedication on January 8, followed by "open house" to more than 1,000 invited guests from all parts of the country. Most of those invited were technical representatives of firms and laboratories which have been cooperating with the QMC on subsistence development and supplies.

Major General Edmund B. Gregory, Quartermaster General of the United States Army, made the dedicatory address and unveiled the bronze plaque. Colonel Georges F. Doriot, officer in charge of the research and development branch of the Office of the Quartermaster General, acted as chairman of the meeting.

Colonel Rohland A. Isker, commanding officer of the laboratory, responded to an address by Brigadier General J. E. Barzynski, QMC, Commanding General of the Chicago Quartermaster Depot, reviewing the recent history of the laboratory and presenting a large symbolic key to the premises, by pledging that the key would "be used only to unlock the door to further knowledge that will assist in solving the many problems before us."

Other speakers were Major General Stephen G. Henry, of the development branch of the General Staff; Brigadier General Carl A. Hardigg, of the storage and distribution branch, Office of the Quartermaster General; and Lewis W. Waters, of General Foods Corp.

The new laboratory occupies an estimated 20,000 sq. ft. of space on the top floor of Building B at 1849 West Pershing Road, Chicago. It is about three times as large as the old laboratory, and research personnel has been doubled. In addition to the orthodox chemical and bacteriological laboratories, it has specially equipped food technology laboratories for packaging, baking, dehydrating and canning.

Major Virgil O. Wodicka is executive officer. In charge of the several branches are: Dr. Jesse H. White (retired Lieutenant Colonel) in charge of animal products; Captain Stuart G. Dunlop, technical branch (chemical, bacteriological and vitamin determinations); Major R. R. Melson, packaging; Captain Lewis A. Wright, general products; Lieutenant Owen N. Tucker, cereal and baked products; Captain Walter A. Maclinn, rations branch; Lieutenant George Gelman, conservation; Miss Marion C. Bollman, head dietitian.

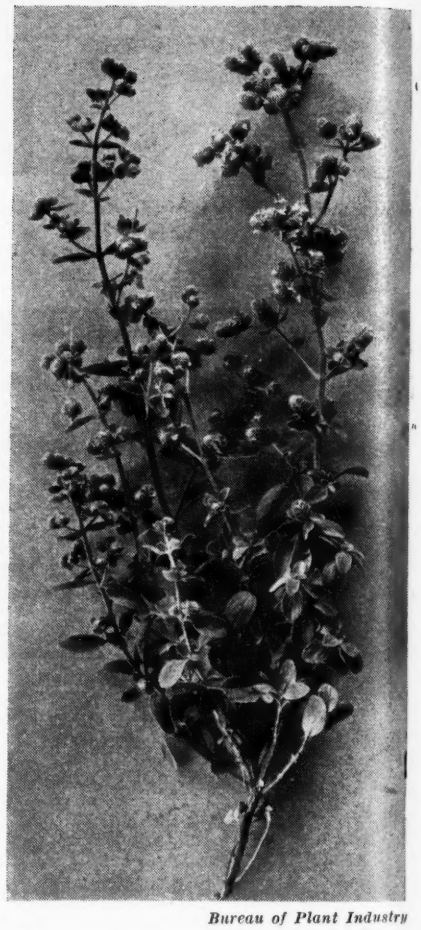
Signal Corps

Humidity room in which packaged foods can be tested under tropical conditions. Lt. Robert deS Couch examines a case of Air Force Flight lunch.

Production and Characteristics Of Oil of Marjoram

By ERNEST GUENTHER, Chief Research Chemist, Fritzsche Brothers, Inc., New York, N. Y.

This flavoring agent is useful in many food products. It has the advantage of high flavor concentration and uniformity. The author tells where and how plant is grown, how oil is distilled and gives properties



Bureau of Plant Industry

The marjoram plant. It can be grown in many sections of the United States.

THERE exists quite some confusion in regard to the essential oils known as origanum oils and the botany of the plants from which these oils are distilled. The same is true of marjoram oils. The vernacular term "marjoram" comprises several aromatic plants belonging to different species. The best known is undoubtedly *Origanum majorana* L. (fam. *Labiatae*) which grows wild as a perennial herbaceous shrub on sunny hillsides of southern Europe and North Africa; it is also cultivated extensively as sweet marjoram (*Majorana hortensis* Mnch.), an annual herb, in central Germany, Hungary, southern France, Tunisia, and lately also in the United States. The French term *marjolaine* includes also *Origanum vulgare* L. which grows wild in Mediterranean countries but is not actually used for oil distillation.

The United States has been importing from Spain for some years an essential oil labeled oil of marjoram or wild marjoram oil. This oil is distilled from *Thymus mastichina* L. (fam. *Labiatae*), the Spanish *mejorana silvestre* or *tomillo blanco* which grows wild in Southern Spain, especially around Granada and Malaga. The chemical composition of this oil is entirely different from that of sweet or garden marjoram, its odor being harsher, and cineol- eucalyptus-like.

For the sake of clarity, we shall in this article refer to the two oils as sweet marjoram and Spanish wild marjoram.

Oil of Sweet Marjoram

Description—Sweet marjoram grows in bunches or tufts 8 to 16 in. high. The flowers are small, greenish white; the seeds, oblong, very fine and dark brown in color; the leaves, small, oval, whitish and soft. Because of their strong, highly aromatic, spicy and pleasing odor and flavor, the dried leaves are widely used as a condiment for seasoning soups, dressings, stews, and especially certain types of sausage. Steam distillation of the leaves yields the essential oil.

Habitat and Range—Marjoram is primarily a warm-climate plant and, as such, rather sensitive to cold. Yet, it is hardy enough to be grown in cooler regions, provided the plants are well mulched with straw or leaves for protection from winter killing or, still better, grown as an annual crop and planted anew each season.

Sweet marjoram grows well in fertile garden soils sufficiently loose for the very small seed to germinate and the tender little plants to penetrate the crust of earth formed by rain. Great care must be taken to select loose soil, or much of the planted seed will be lost. The ground should be well drained, exposed to ample sunlight, fertilized and irrigated. Although the plant resists drought, prolonged periods of dryness are harmful.

Climate seems to exercise considerable influence upon the shape of the plants, those cultivated in Tunis growing sometimes more than 3 ft. high.

The finest quality leaf material originates in central Germany (Aschersleben, Province Saxony) simply because the German growers do not permit the plants to go to seed. It should be noted that the seed is aromatic, containing essential oil, for which reason it is employed in confectioneries and French confitures. When the plant is cut before the formation of seed, all its essential oil is contained in the leaves, for which reason the German marjoram leaves are much more fragrant and free of seed aroma. German growers purchase their seed material from French seed houses which consider the dried leaves more or less a byproduct, the emphasis being on the production of seed for the innumerable small farmers and gardeners who raise marjoram as a culinary garden crop.

Planting and Cultivating in Germany—Before the present war, the region around Aschersleben, Germany, produced about 800 to 1,000 tons of dried marjoram herb yearly. These figures represent the weight of the dried leaves after removal of the stalks, and correspond to about one-half the weight of the freshly cut plants.

In April the seed is sown with drills directly in the fields. The plants grow very densely in rows which are spaced 8 to 9 in. apart. The depth of the drills is less than that employed for dill (*Anethum graveolens*). The plants must be resown every spring. Cutting takes place in August and September. The cut plant material is carefully dried, stalks, dust and sand removed, and the dried leaves marketed for culinary purposes. The so-called "distillers' quality" consists of material which is not as carefully purified.

Planting and Cultivating in Hungary—In a previous publication,[1] the

writer has described in detail the planting, cultivating, harvesting and distilling of sweet marjoram in Hungary, where the industry is centered around the town of Kalocsa.

Planting and Cultivating in France—France has always preferred to cultivate sweet marjoram in the south, since plants grown too far north do not ripen to the point of seed production, in which France is mainly interested. Producing regions are located around St. Remy-en-Provence (Department Bouches-du-Rhône) and also in the Department de Vaucluse.

Seeds are selected from the best plants and sown in nurseries. When the young plants are sufficiently strong, they can be transplanted. Frequent weeding, hoeing and watering are necessary. The harvest takes place in August-September.

Planting and Cultivating in Tunis—In recent years, Tunis has become an important producer of sweet marjoram. In fact, most of the dried leaf material used in France as condiment or for distilling originates in Tunis. Around Bizerte the plants grow in almost a wild state, but the most important plantings are located near the large olive orchards of Sfax. Marjoram leaves destined for distillation should be cut when in full bloom. Therefore, in Tunis the plants are gathered during the early part of May when the flowers begin to open; a second cutting is made in July.

Planting and Cultivating in the United States—According to Crooks and Sievers,[2] sweet marjoram, a warm-climate plant, makes good growth also in cooler regions but is easily affected by frost. Therefore, it is preferably grown as an annual, for which purpose the very small seed is best started in the greenhouse and the seedlings transplanted to the fields after all danger of frost has passed. Propagation by cuttings is also entirely practicable.

Marjoram can be grown in many sections of the United States—as an annual in the northern states and as a perennial or annual in the southern states and on the West Coast. The fact must not be overlooked, however, that marjoram is a comparatively small crop and according to Crooks and Sievers, less than 100 acres probably would be sufficient to meet annual domestic requirements. The United States still receives shipments of Spanish marjoram oil distilled from plants growing wild in Andalusia. Should these shipments be stopped for some reason, our food industry surely would resort to sweet marjoram oil produced in the United States, in which case the acreage might be increased considerably.

Drying and Preparation for Market—The proper drying of sweet marjoram leaves is quite a delicate task, especially if a carefully selected and well-cleaned quality of good color is to be delivered. The best results are obtained in drying sheds; direct exposure to the sun tends to break the stalks and make the leaves brittle. Care must be taken also to exclude rain or dew while the leaves are being dried. Only under these conditions is it possible to preserve the original green tint of the leaves. If exposed to direct sunlight, the plants dry in two to four days; in well-ventilated drying sheds, the process lasts about one week.

To detach or strip the dried leaves from the stalks, stone rollers are often used in France, or the entire plants are beaten. The leaves and seeds are then shaken in a sieve to remove the seeds. Foreign matter is picked out by hand. The Hungarian producers pack the plants in wide-mesh sacks and shake them to eliminate seeds, dust and earth.

Crooks and Sievers[2] mention that under certain conditions some herb can be cut from the plants several times during the summer. However, there appears to be no practical way of harvesting marjoram other than by cutting the entire plant at the ground and drying the herb. If only moderate amounts are handled, the plants can be hung from poles or rails in a convenient building where they can dry thoroughly. For large acreages a more practical way would have to be found. The plants could be packed close together on trays stacked to permit good circulation of air. When the herb is dried, the small stems with the leaves are removed from the more woody parts by any practical means that can be devised. Crooks and Sievers believe that most of the desired parts of the plants can be obtained by flailing or threshing.

According to information obtained by the writer in Hungary, 1,422 acres yield about 300 to 400 kilos, in rare cases 500 kilos, of cleaned and dried marjoram leaves. Crooks and Sievers indicate for the United States a possible yield of about 2,000 lb. of herb material per acre.

Distillation—The dried leaf material is packed into stills. Live steam generated in a separate steam boiler is blown through the material, and the essential oil collected in a Florentine flask. In our French factory in Seillans (Var), we obtained 0.4 percent of oil from fresh French sweet marjoram herb, 0.8 percent from dried French and German herb, and 2.25 percent from dried Tunisian plant material. The Hungarian distillers obtain as an average yield about 1 percent of oil from the dried herb. Gildemeister and Hoffmann[3] indicate a yield of 0.3 to 0.4 percent for fresh, flowering herbs and a yield of 0.7 to 3.5 percent for dried herb material.

Physico-chemical Constants of Sweet Marjoram Oil—Oils distilled in our French factory from dried herb material showed constants which varied between the following limits:

(*Turn to page 136*)

Peasant women in Hungary cultivating marjoram with a hand shove-hoe.

Pectinates Improve Frozen Fruit

Trials show that they reduce drainage of juice upon thawing, improve appearance of fruit and effect other advantages

By R. E. BUCK,* G. L. BAKER† and H. H. MOTTERN*

THROUGH the use of pectinates, it is possible to reduce the amount of juice which drains, upon thawing, from frozen strawberries, cherries, raspberries and peaches. And not only is this important advantage realized, but the appearance of the fruit is improved. Further, the presence of pectinate in the fruit makes possible the direct preparation of jellied products for desserts and other purposes.

These discoveries were made in preliminary trials during the summer of 1942, when several pectinate and pectin preparations were compared in the freezing of the products mentioned. These studies also indicated that pectinates prepared by either acid or enzyme demethylation are equally effective.

Purpose of Investigation

The most common treatment given fruits is the addition of sugar or sugar sirup before freezing. The addition of dry sugar draws the juice from the fruit and thus forms a sirup, which covers the fruit and protects it to some extent from the air and also slows down enzyme action. One disadvantage, however, is that in some cases the juice drawn from the fruit amounts to 40 to 50 percent of the initial weight of the fruit.

At the beginning of the investigation, it was thought that the pectinates might form a gel on the surface of the fruit and thus reduce the drainage of juice. This was found to be the case. It has been possible to evaluate the different pectinates from the standpoint of their use in freezing fruits by measuring the amount of drained juice. In addition, these pectinates should be of use in the preparation of desserts, jams, preserves, purées, fruit ices and ice cream toppings from the frozen product.

The results reported here are obviously of a preliminary nature. Before the feasibility of the use of pectinates in freezing fruits can be determined, further study will have to be given to such matters as cost, method of using and improvement of the product.

Experimental Procedure

Experimental frozen packs of strawberries, red cherries, raspberries and peaches were prepared. The strawberries were hulled, washed and sliced before packing. The cherries were washed and pitted, and the raspberries were washed. The peaches were halved, pitted, steamed for 70 seconds, peeled and sliced. In all the experiments fruit of about the same degree of maturity was used.

After the fruit was prepared, it was mixed with sugar and pectinate in varying proportions. A dry-sugar pack was used in most of the experiments. In all cases, the pectinate was first mixed with the sugar, and this combination was then sprinkled over and mixed with the prepared fruit. The fruit-sugar-pectinate preparations were packed in containers and placed in the freezer at a temperature of approximately 0 deg. F. (–18 deg. C.). The containers used were 4- and 8-oz. round, wide-mouth, screw-cap glass jars and 8-oz. waxed, cardboard cups which were paraffine sealed.

The samples were held in the freezer at 0 deg. F. (–18 deg. C.) and examined within 3 to 4 days after freezing and again after a storage period of 4 to 6 months. For examination, the packages were opened and allowed to stand until the contents reached room temperature (approximately 4 to 5 hours).

The samples were then turned into a 4-in., hemispherical, 12-mesh sieve and allowed to drain for 10 minutes. The weight of drained juice was then obtained, and the soluble solids content (refractometer) and viscosity of the juice were determined. The samples were then examined for color, gel formation and general appearance.

A number of pectinates differing in methoxyl content and method of preparation were used. The properties of some of them are given in Table I. These are the pectinates used for the preparation of the curves in the chart, which represent the general results obtained after a 4- to 6-month storage period.

The methoxyl content indicates the degree of demethylation. The methoxyl content of pectin obtained from apples or citrus fruits is about 10 percent. Gel power is arbitrarily defined as the weight of water gelled to a strength of 50 cm. of water pressure on the Delaware jelly tester by one unit weight of pectinate at optimum calcium concentration and pH of 2.9 to 3.5 in the presence of 35 percent of sugar in the final gel (1). The optimum calcium concentration is the ratio of calcium to pectinate that gives the highest gel strength. Too much calcium causes a precipitation of the pectinate, with a resulting decrease in gel strength.

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TABLE I—Properties of Pectinates Used and Quantity Required for 50 Percent Reduction in Drainage of Juice.

Sample No.	Method of hydrolysis	Methoxyl (percent)	Calcium, optimum	Gel power	Pectinate required for 50 percent reduction in drainage of juice: Strawberries (percent)	Cherries (percent)	Raspberries (percent)	Peaches (percent)
H–52	not demethylated	10.00	....	232*	....	**	1.00	.....
H–54	acid	7.78	.100	180	0.60	**	0.50	1.10+
H–55	acid	6.55	.035	95	....	..	0.75	2.00+
H–52D	acid	6.10	.070	200	0.42	..	....	.....
H–56	acid	5.80	.030	100	....	..	1.28	2.00
H–59	acid	5.50	.030	100	....	..	....	2.00+
E–34	acid	4.31	.030	139	1.0+	..	....	.....
H–50A	enzyme	4.98	.018	83	....	..	....	1.00

*Jelly grade. **Cherries, fruit-sugar ratio = 4:1 – 0.97% 5:1 – 0.75% 6:1 – 0.80%

Results

The most outstanding effect of the addition of pectinate to fruit before freezing is the reduction of the amount of juice draining from the thawed fruit. The pectinate combines with the calcium of the fruit, forming a gel on the surface. Although the juice may be withdrawn from the fruit, some is held in the form of a gel and does not drain off or separate from the fruit on thawing. As the concentration of pectinate is increased, the gel formation increases, resulting in a smaller amount of juice draining from the fruit. Thus the drained-weight determination furnishes a means of evaluating the different pectinates.

In addition to reducing the amount of drained juice, the pectinate improved the general appearance of the thawed fruit. There was less darkening and a more natural color in the fruit. The gel formation on the surface gave the fruit a gloss, which improved its general appearance. In Table I are shown the quantities of the different pectinates required to reduce the quantity of drained juice by 50 percent. This 50 percent reduction was accompanied by the most desirable amount of gel formation. Increased quantities of pectinate further reduced the amount of drained juice, with the formation of excessive quantities of gel in the form of rather solid clumps. This detracted from the appearance of the fruit. While the figures cannot be considered absolute because of the fairly large experimental error, they indicate the relative value of the different pectinates.

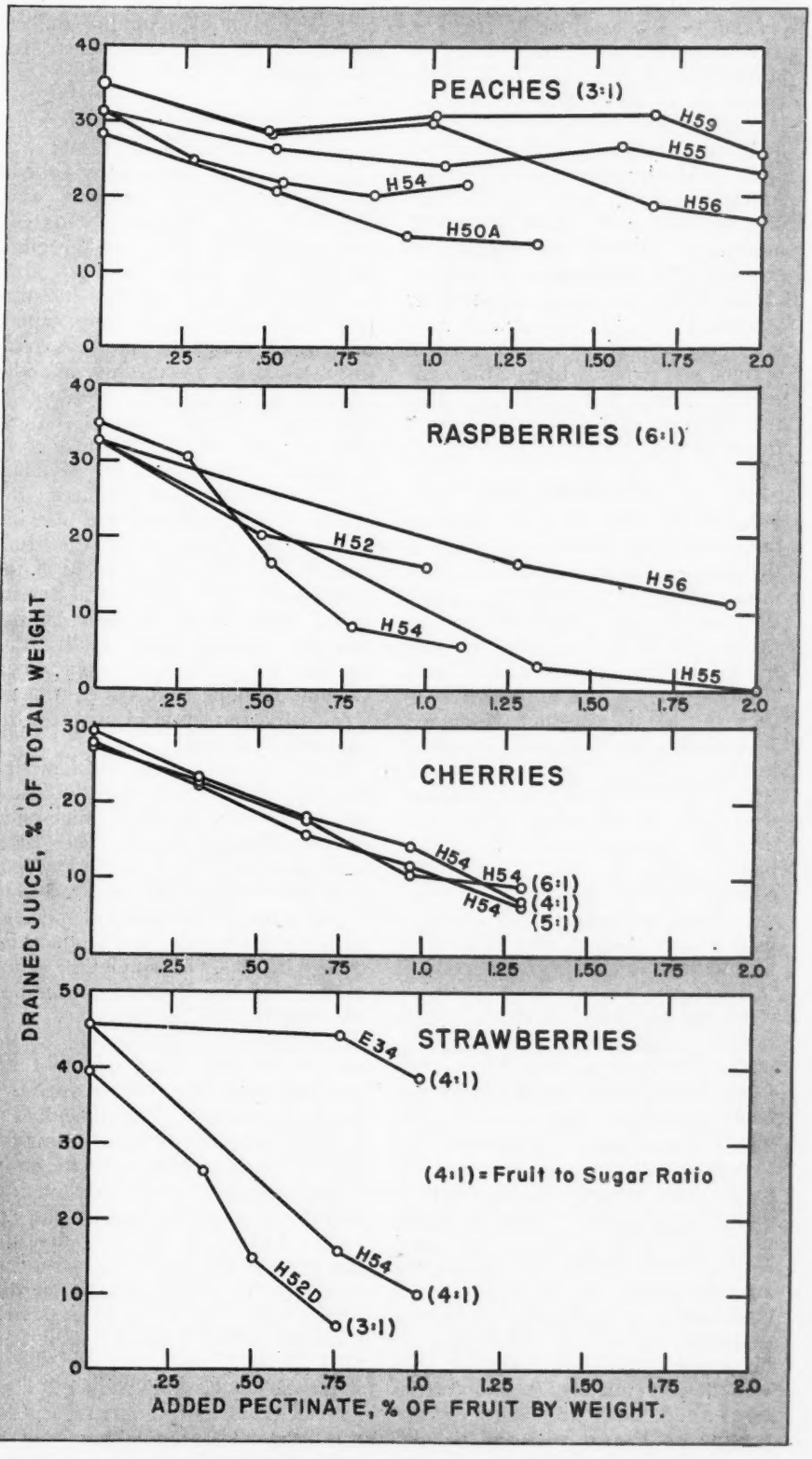
The results for the samples examined immediately after freezing and those examined after the longer storage period were in fairly close agreement for all the fruits except peaches. There was a more marked reduction in the quantity of drained juice in the samples of peaches examined immediately after freezing.

Strawberries

The results of freezing experiments on sliced strawberries of the Dorset variety are shown in the chart. The curves show that the addition of 1 percent of two pectinates used (H-54 and H-52D) decreased the quantity of drained juice from 40 percent or more to 10 percent or less. All the pectinates gave satisfactory results with the exception of E-34, which did not give a product much superior to the controls. Higher concentrations of this pectinate might have had a more pronounced effect. The gel power and calcium optimum for this sample were lower than for the other samples. Sample H-52D, which had a higher gel power than the others, was the most effective.

Cherries

Pectinate H-54 was used for all the tests on Early Richmond cherries. The curves show that the addition of the pectinate reduced the amount of drained juice from about 30 percent to less than 10 percent. It also improved the appearance of the fruit. There was less darkening, and the cherries had more nearly the appearance and texture of the fresh fruit. The results indicate that the optimum concentration of pectinate is about 0.8 percent, a larger proportion of pectinate causing the formation of too much gel,



Effect of different pectinates in reducing drained juice from four fruits after storage of 4 to 6 months.

which detracts from the appearance of the fruit.

Raspberries

Red raspberries (Latham variety) were used for the freezing test. The curves show that the presence of the pectinate reduced the amount of drained juice of two (H-54 and H-55) of the four samples used about 30 percent to 5 percent or less, with a corresponding improvement in the appearance of the thawed fruit. One sample of an undemethylated pectin, H-52, was used and found to be not quite so effective as a demethylated product, H-54, with a high gel power. About one-third more of the undemethylated pectin than of the demethylated product was required to give the same reduction in the amount of drained juice. More of pectinate samples H-55 and H-56, which have low gel powers and low calcium optima, was required to give the same results. These pectinates were effective, however, if large enough quantities were used.

Peaches

Some typical results of the addition of pectinate to peaches are given in the chart. Examination of the samples immediately after freezing showed that the pectinate was effective in reducing the amount of drained juice, although not so effective as with the other fruits. After a 4-month storage period, however, the results were not so marked, as shown in the curves. Except for pectinate samples H-56 and H-50A, the reduction was small, as compared with that of the other fruits. The pectinate, however, gave the fruit a better appearance than that of the controls. Several varieties of peaches were frozen, including Golden Jubilee, Hale Haven, Elberta and Hale, with no apparent difference in the action of the pectinate.

Up to this point in the investigation, it was assumed that the gel power of the pectinate was the determining factor in its action. As shown in the chart, however, pectinate H-50A, which has a very low gel power, was the most effective of the samples used. This sample was an enzyme-demethylated product, whereas all the other samples used up to this point were acid-demethylated. Consequently an experiment was set up using 25 preparations of pectinates of varying properties in order to determine the factors involved in reducing the amount of drained juice. No correlation could be found between the amount of drained juice and the different characteristics and properties of the pectinates, such as methoxyl content, calcium optimum and gel power, or the method of demethylation. Particle size and rate of solution may be factors of as much importance as the others listed. Most of the pectinates worked fairly well in reducing the amount of drained juice, regardless of the properties of the individual pectinates. From this it appears that an actual test is the only sure method of determining the effectiveness of a given pectinate for freezing use.

Commercial Packs of Frozen Peaches

Experimental packs of Elberta peaches with added pectinate were frozen in two commercial freezing plants, one in Virginia and the other in New York State. A sugar sirup was used in place of the dry-sugar pack used in the laboratory experiments. The samples of pectinate were dissolved in the sugar sirup, and the fruit was then packed according to the usual procedure followed at these plants. The results obtained were similar to those obtained in the laboratory. The pectinate reduced the amount of drained juice and also improved the appearance of the fruit. Appreciable browning of some of the peaches did not occur until several hours after thawing. The control samples browned rather rapidly. Predipping the peaches in a solution of calcium chloride and citric acid increased the formation of a gel on the surface of the fruit.

Both enzyme- and acid-demethylated pectinates were used in these commercial trials and also a high-ester, undemethylated pectin. The latter was not so satisfactory as the low-ester pectinates. There was not a great deal of difference in the action of the acid- and enzyme-demethylated products, although in one set of samples the action of the acid-demethylated preparation was slightly more advantageous.

One difficulty encountered in the use of the sugar sirup was that the pectinate made the sirup so viscous it was hard to handle. This difficulty can probably be overcome by adjusting the concentration of the pectinate or by raising the pH value of the sirup slightly, which will decrease the viscosity. More work must be done on this point to determine the amount of pectinate that will produce the desired results and yet leave the sirup in such a condition that it can be easily handled.

In one set of samples in the commercial plant tests a dry-sugar pack was used. The results were not so satisfactory as those obtained in the laboratory, inasmuch as there was no appreciable reduction in the amount of drained juice. There was an increase in the viscosity of the juice but not sufficient to reduce the amount of drainage. Thirty-pound samples of peaches were used for this pack, and probably the pectinate was not completely dispersed through the fruit with the result that there was little gel formation. There is no reason to believe, however, that the pectinate would not act in the same manner as in the smaller packages if it had been completely dispersed on the surface of the fruit.

Predipping in Calcium Chloride Solutions

Since calcium is essential for the formation of the pectinate gels, it was thought that the addition of calcium might increase the action of the pectinate. Experiments shows that predipping the fruit in a solution containing 0.2 percent calcium chloride before packing definitely aided the action of the pectinate. This pretreatment reduced the amount of drained juice 8 to 10 percent more than the pectinate alone. Calcium chloride mixed with the pectinate before addition to the fruit decreased the action of the pectinate, probably because of the difficulty of thoroughly dispersing the small amounts of this chemical through the fruit-sugar-pectinate mixture. The local concentrations of calcium served only to precipitate some of the pectinate and thus reduce its effect.

Also a predip of the peaches in a 2 percent solution of citric acid lowered the pH value sufficiently to increase the effectiveness of the pectinate. This is probably because the peaches were not quite so acid as the other fruits used, and the acid produced a more favorable pH for the gelling of the pectinate. The failure of pectinate to improve Elberta peaches, noted by Baker (2), might have been due to an unfavorable acidity.

Effect of Added Pectase

It was thought that the addition of the enzyme pectase to the fruit before freezing might act on the natural fruit pectin and convert it to pectinic acid, which would have the same effect as added pectinate. Accordingly, samples of all the fruits used were frozen with an eggplant-pectase preparation added to the sugar. The desired effect was not obtained; there was little reduction in the amount of drained juice and no noticeable improvement in the appearance of the fruit. There was no gel formation, although there was a slight increase in the viscosity of the drained

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EDITORIALS

LAURENCE V. BURTON, Editor

Slight Progress By National Roster

Dr. Leonard Carmichael, psychologist, president of Tufts College on leave as director of the National Roster of Scientific and Specialized Personnel of the War Man Power Commission, has at last gotten busy on something he should have done two years ago. He is taking steps to ensure that the armed forces will assign "inductees to duties in which their special qualifications will be advantageously used." This, of course, applies only to those inductees who are listed in the National Roster.

Incidentally, all of the people listed on the roster are being asked to fill out another voluminous questionnaire. Though this questionnaire is something of an improvement over the predecessor document as regards food specialists, its classification of subjects leaves one wondering who "master-minded" it. Thus carbohydrates, "food proteins" and casein come under organic chemistry, while all other foods come under biochemistry. This, however, is but a trivial manifestation of the weakness of psychology.

The new questionnaire again designedly omits all functional specialization such as food technologist, food engineer, packaging specialist and other specialties which are in considerable demand by the Quartermaster Corps. Dr. Carmichael cannot plead that he has been denied knowledge of these categories. Two past-presidents of the Institute of Food Technologists have labored with him in vain. Yet the current revision of the National Roster is a desirable step toward a goal that may be achieved when the war is over.

Business Men Still Needed In WPB

The machinery for demobilization of industry after the war will be the War Production Board. Industry must leave its executives on the board to continue the demobilization job. The exodus of business executives from Washington has got to stop, for unless competent men are left to close up the affair their successors may not be to the liking of business. If this occurs, business has no recourse.

Pork Situation Nearly Out of Hand

Pork packers are getting quite a work-out these days when nearly all plants have been deluged with more hogs than they can kill and process. To the public, the current oversupply has meant only some extra dressed pork with low-ration-point value. But back of all this is something of greater significance.

The recent large hog run was due at least a year ago, and in a free price economy the farmers would have marketed their surplus hogs early in 1943 instead of in the winter of 1943–44. You will recall the scarcity of corn for grinding that was acute in the first quarter of 1943 because the farmers were not selling. Commodity Credit Corp. tried to remedy the situation by "calling" all corn loans, but the farmers merely paid off the loans by borrowing from commercial banks. Corn was good property to keep, and price ceilings fixed by OPA made it still more profitable to feed the corn to hogs than to sell it to elevators.

In time there were too many hogs for the feed supplies available, and the inevitable movement of livestock to market began. So far so good. But soon there was no more storage space for the pork products. Freezer storage space—a surge point—where a lot of pork would be held frozen for further processing into cured meats, was not sufficient for the volume. Packing plants were way overloaded. The only alternative was to encourage public consumption of dressed—not cured—pork by lowering its ration-point value for a time.

This excessive amount of fresh pork was foreseeable. In fact, none other than Secretary of Agriculture Claude R. Wickard told this department on Dec. 28, 1941, that he was much worried over the outlook, lest killing and packing facilities be insufficient for the burden that would soon some. That the rush came much later than he anticipated is explained by the interaction of CCC and OPA price policies over which he had but little influence. If too much pork has been forced on the market it may not be exactly wasted, for it is consumed by people, but there is likelihood of a later period of scarcity when the rush is over.

Those who hanker for a centrally managed economy should note the foregoing incident of nation-wide proportions that has not worked out according to plan. Indeed, it scarcely can be said that there was much of a plan. With ceiling prices fixed by OPA, support prices set by AAA, corn loan prices set by CCC, set-aside orders issuing from both the Army and the War Food Administration, and new processing facilities as well as freezer warehouse construction under the control of WPB, who is there to decide what shall be done and when?

While the United States had accomplished miracles of armament production, the food situation has not shared the same sort of handling. It is to be hoped that no miracle will be needed to keep us up to our future food obligations or domestic needs.

No Secret to Good Food

There is no special secret about good food, except the know-how. Industrial food preparation is no different from home food preparation insofar as the principles of good cooking are concerned.

Every little while some one asks our opinion on a new food product undergoing developments, and from the current experiences it is apparent that many experimenters with new foods have but the scantiest notion about plain ordinary good cooking or good food.

A case in point is a powdered soup mix, oppressively heavy with celery seed flavor, and apparently lacking in the "undertones" of flavor— those underlying flavors that are the foundation on which the characteristic flavors rest. Such "undertones" are

onion, liver, meat extract, (monosodium glutamate)—to name a few.

Another case in point is the complaint that butterscotch flavor is difficult to attain, which brings up a question that has never been thoroughly examined—the differences between burned sugar, butterscotch and caramel. All that appears to be known is that burned or carmelized sugar is bitter, but if sugar is carmelized in the presence of milk it tastes smooth and mellow.

Space limitations preclude a lengthy commentary on the need for knowledge of good cookery when one is developing a food product formula. Three things are, however, indispensable to the one who is doing the job:

1. You have to know good food from punk stuff.
2. You must know how to do a good job of ordinary home-kitchen cookery.
3. You should own and study "Experimental Cookery," by Belle Lowe (John Wiley & Sons, New York).

Food Man to Head FDA

Few indeed have been the appointments in Washington that merit so much commendation as that of placing M. Lee Marshall in charge of the Food Distribution Administration of W.F.A. Only a few months ago he left the Materials and Facilities Branch of W.F.A., where he made a splendid record, to resume his civilian job of Chairman of the board of Continental Baking Corporation. In his new government task he succeeds Roy Hendrickson who goes to UNRRA as deputy director.

New Research Foundations

Signs of progress of an important character are to be seen in the creation of two new research foundations: The Refrigeration Research Foundation and the Sugar Research Foundation. Both of these are patterned after the Nutrition Foundation which has had two years of very successful existence.

Industry has guaranteed to support investigations of fundamental character in the several fields. It is a commendable activity on the part of the sponsoring industries and is particularly important to the entire nation for the action is wholly spontaneous and in a democratic country.

Creation of three such research foundations in wholly different fields appears to mark the beginning of a time when the United States will outstrip all other nations in the effort to achieve the Four Freedoms. Most interesting to us is the fact that all of these foundations have arisen in the food field. Verily, the food industry is going ahead to unbelievable achievements.

Urges Postponed Consumer Purchases

Bernard M. Baruch has recently urged that the public be informed that what they buy now will not be as good as they can get after the war is over. The advice of this wise man is to save now to get better values later.

Organized Labor Studies Your Profits

Long ago (Food Industries, January, 1941, page 35) we warned that most strikes for higher wages were merely the effort of union leaders to beat the Federal Income Tax Collector to the cash box. (This does not apply, however, to jurisdictional strikes, or controversies other than wage matters.)

The foregoing principle receives further emphasis when it is realized that CIO employs about 65 fully trained economists in its national organization. Every business statement is as carefully scrutinized as if it were offered to a bank as justification for a loan. If the CIO economists decide that the corporate earnings will stand a wage increase, that increase is just about as good as granted, as long as the Wagner Act remains on the statute books. Furthermore, it has been discovered that the CIO board of strategy frequently knows more about the economics of a business than its own managers.

Thoughts on Black-markets

If your memory is long enough to go back to the depression years of the 'Thirties,' you may recall some of the speeches by professional economists. Some of them stated flatly that there was no such thing as a law of supply and demand. Some of those who were mathematically inclined had charts, graphs, and equations which were alleged to state the nonexistent law. But all that is water over the dam. In the past two years no voice has been raised to deny the supply-demand relationship which all business men know is a powerful force affecting food prices.

Any one who reflects on the recent fiasco of price control of livestock by setting a ceiling price on dressed meats must realize that this method of dealing with a rising market must have been dreamed up by the prewar economists who denied the existence of a law of supply and demand.

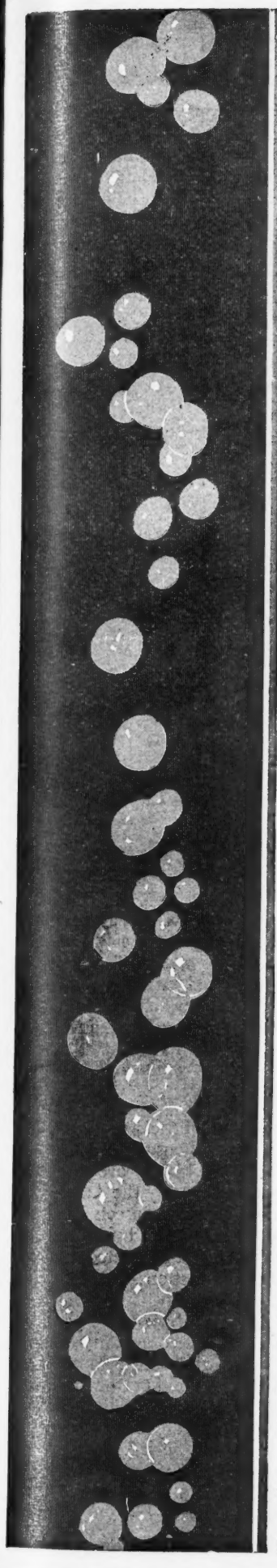
Ceilings on dressed meats were stated, but live-animal prices kept on going up until no one could pay the going price for butcher stock and sell the meats under the ceiling prices. How could this occur? Simply because the demand for meat—call it black-market if it makes you any happier—was so much greater than the supply that live-animal prices kept going up, despite OPA.

You might keep some mementos of black-market days on hand to remind the theoreticians of the future. Chances are that anyone who, in the years to come shall allege there is no such thing as a law of supply and demand in the food field is much too young today to know what it is all about. Perhaps he has not even been born yet. You would be doing him a future service by saving some mementos of current times.

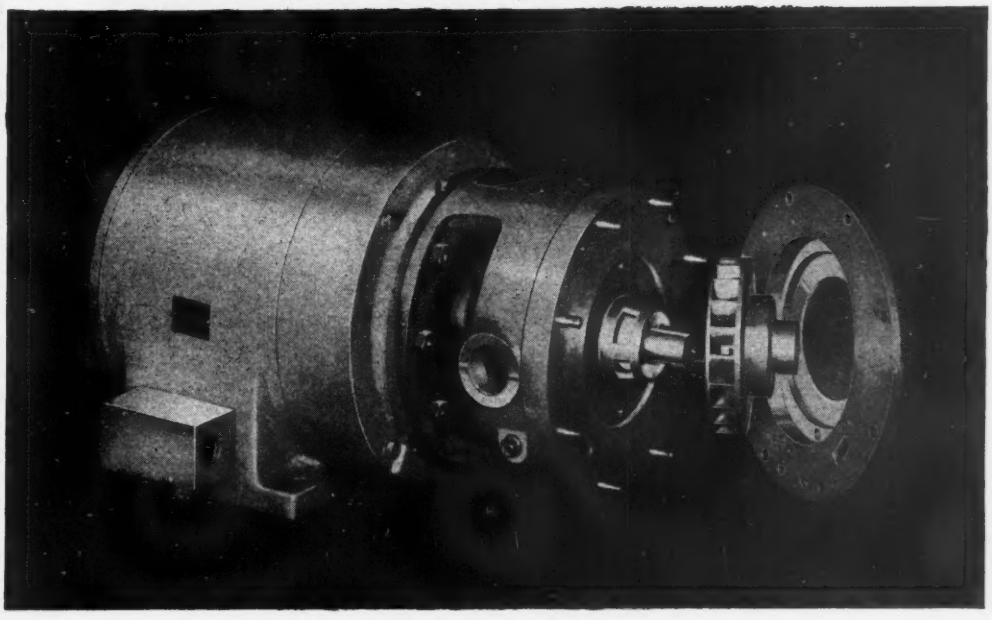
The Rubber Scarcity Will Continue

There is no hope for easing the rubber shortage in 1944. Despite the amazing growth of synthetic rubber production, the need to conserve rubber is as great as it ever was. The average airplane tire takes as much rubber as 30 civilian auto tires. The Emden raid that cost us 19 bombers and three fighters meant that 66 big tires were gone forever. These are equivalent to about 1,980 civilian passenger tires, or about 500 truck tires.

Owners of truck fleets and essential civilian cars must figure on scarcity of rubber as a continuing factor in their operations until at least 1945.



ONLY CLEAN AIR CAN REACH YOUR PRODUCT FROM A NASH COMPRESSOR



Here is a compressor designed perfectly to meet the needs of the Food Plants. It is simple, for it has only one moving part, a rotor cast in one piece and rotating in the casing without metallic contact. This means trouble-free operation over long periods. It is compact and requires little valuable floor space. Its oversize ball bearings seldom require attention or lubrication. No lubrication is required in the interior, so that the air is kept clean from the time it enters the pump. • But this is not all. The compressing medium in the Nash Pump is a rotating column of clean water. The air is in intimate contact with this water in passing thru the pump and is actually scrubbed while it is being compressed. Dust present in the atmosphere is removed, and the air delivered free from dirt, oil, or heat, without the use of scrubbers or air washers. Think what this means in terms of purchase cost and floor space occupied by complicated air washing apparatus. • These pumps are proving their worth in the most trying service. They are ideal for transferring beer or wort from tank to tank by air pressure, for maintaining pressure on aging tanks, for supplying compressed air to bottling machines in racking, etc. • Available in any capacity, these pumps deliver pressures up to 40 lbs. absolutely uniform without storage tanks. • You want the most reliable pumping equipment in your plant, so by all means find out more about the Hytor. Our catalog No. 217 is free on request.

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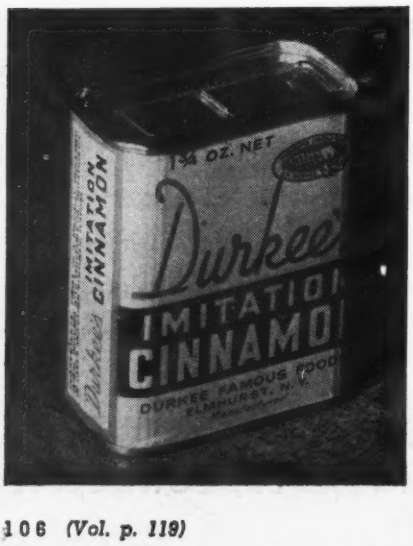
Chocolate Flavor

"D. C. FOUNDATION 20" is a chocolate flavor which serves as a base extender or stretching material for natural cocoa and chocolate products, as well as supplying a chocolate flavor of its own. Manufactured by Domestic Concentrates, Inc., New York, N. Y., it is a dark brown sirup containing sugar derivatives, pure dairy butter, natural chocolate flavor, artificial flavor and U. S. certified color. It is used in making sirups, ice cream, milk drinks, cakes, icings and fillings.

It is regularly packaged in 5- and 10-lb. glass jars and Sealright containers and in 50-, 100-, 200- and 300-lb. Carpenter drums. It is also put up in a trial-size 1-lb. glass jar with a metal screw-cap which has a heavy paraffined chipboard liner.

D. C. Foundation 20 is best incorporated into food products by first mixing it with hot water, milk or sirup, which permits its flavoring and coloring values to be fully utilized. One pound of the flavor will replace 4 to 6 lb. of cocoa or chocolate liquor in the average formula.



Dehydrated Sauces

WHILE dehydrated mixes are not new to the consumer trade, three new dehydrated sauces—spaghetti, meat and mushroom—which can be "made in a jiffy," deserve mention for their appearance at a time when metal containers and closures are restricted. The three sauces are packed identically in double-wall heat-sealed MSAT cellophane envelopes, the label being between the walls. The envelope is formed by placing the label between two sheets of cellophane, folding, heat-sealing the sides, filling, then heat-sealing the end. The packages are compact in appearance and have distinctive sales appeal. The mushroom and spaghetti sauce comes in 1½-oz. sizes and the meat sauce in a ¾-oz. package.

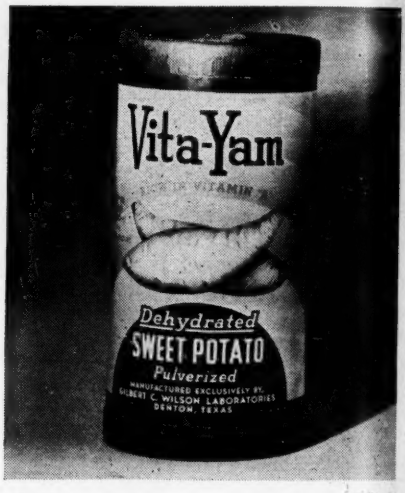
Imitation Cinnamon

DURKEE FAMOUS FOODS, Elmhurst, N. Y., has placed a new product on the grocer's shelves—imitation cinnamon. In view of the short stocks of pure cinnamon, the imitation spice should be useful by itself or as an extender when used in baking in equal amounts with the real spice.

Resembling ground cinnamon in appearance but coarser in texture, it does not have the strong cinnamon taste of the natural spice. Fibers of a specially processed cereal diffused with vegetable oil, imitation oil of cassia and other synthetic flavors are the ingredients which make up this product. The imitation cinnamon is packed in 1¾-oz. fiber containers with a metal shaker top and a slide cover.

Vita-Yam

SWEET POTATOES, which are rich in vitamin A, now come in a dehydrated pulverized form under the brand name of "Vita-Yam." Manufactured by Gilbert C. Wilson Laboratories, Denton, Tex., the dehydrated sweet potato



is packed in a 14-oz. asphalt-laminated cylindrical fiber container with a slip-over top. This new Wilson product blends with and enriches all baking flours especially when used in pies, cakes, cookies and other bakery products.

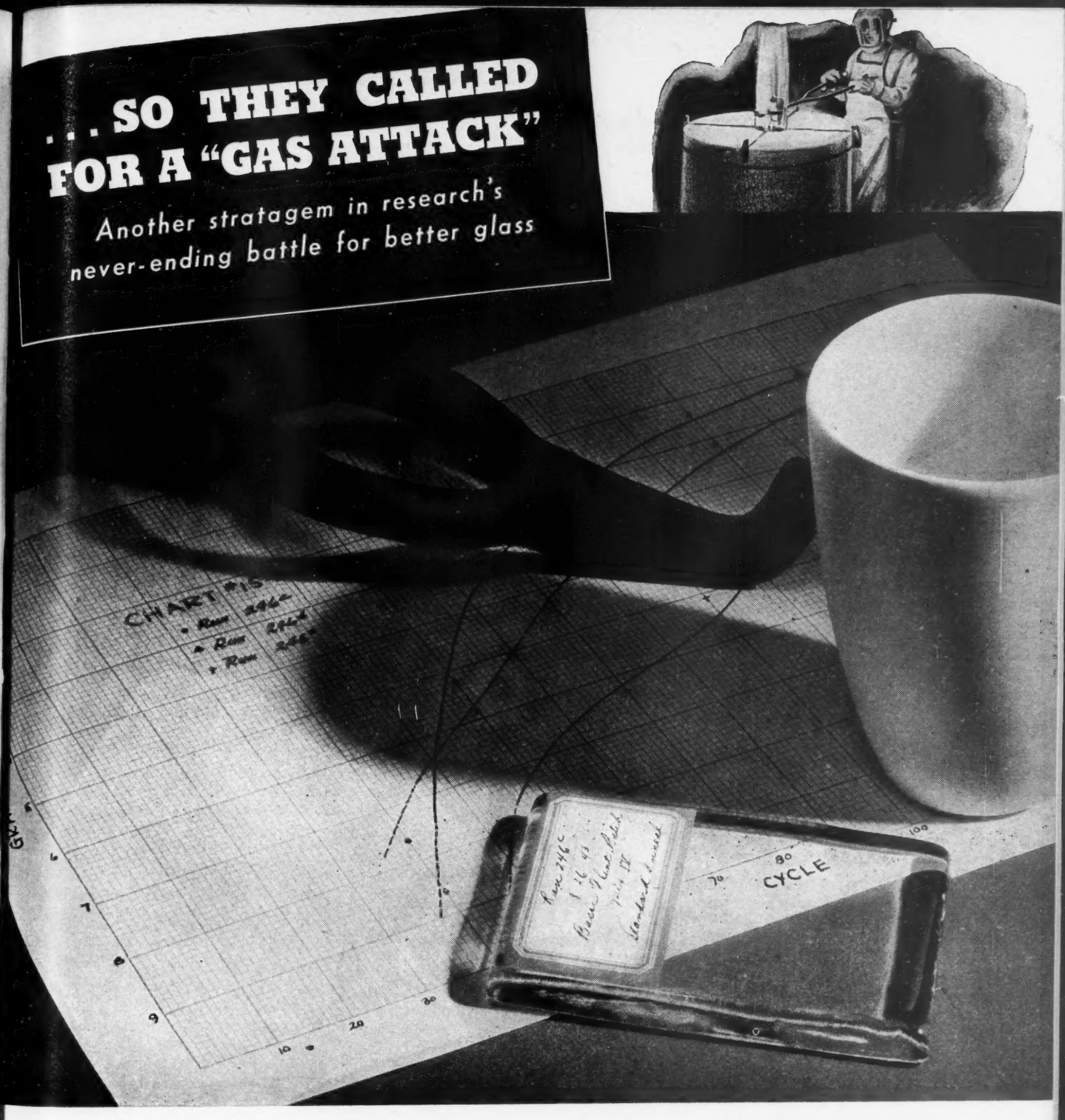
Army Improves Packages

Two new types of packages far superior to those originally used for dehydrated foods sent to troops overseas were developed last year by the Army. Said to keep out moisture, insects and light, they are made of lead foil and the three-ply asphalt-laminated creped kraft bag combinations, both of which are of 5-gal. capacity.

The dehydrated foods are placed in an inner corrugated carton which is sealed, then surrounded by a moisture-proof barrier of either the lead foil, which is heat sealed, or the three-ply asphalt-laminated creped kraft package, which is pressure sealed. A fiberboard outside carton protects the inside package from injury. Two of these packages are enclosed in one shipping case.

. . . SO THEY CALLED FOR A "GAS ATTACK"

Another stratagem in research's never-ending battle for better glass



WHEN the ingredients for making glass are melted, gas is formed. Its movement to the top of the batch stirs the glass and helps "sweep out" tiny bubbles.

Some time ago, Armstrong's glass chemists decided to extend the existing knowledge of the effects of gas action on the uniformity and clarity of glass. They added gas-forming chemicals to the batch. So far in this "gas attack," they have made *287 different batches* of glass. Each had to be individually mixed in crucibles, melted into glass in Armstrong's experimental furnaces, poured into molds, and the resulting slabs of glass subjected to exhaustive laboratory tests.

This project is typical of many lines of research being constantly carried forward by Armstrong's glass chemists and engineers. Some of these tests and experiments result in important advances in glass-making. Some do not. But all of them, taken together, contribute to the background of scientific data and practical knowledge that helps maintain the unusually high quality standard of Armstrong's glass.

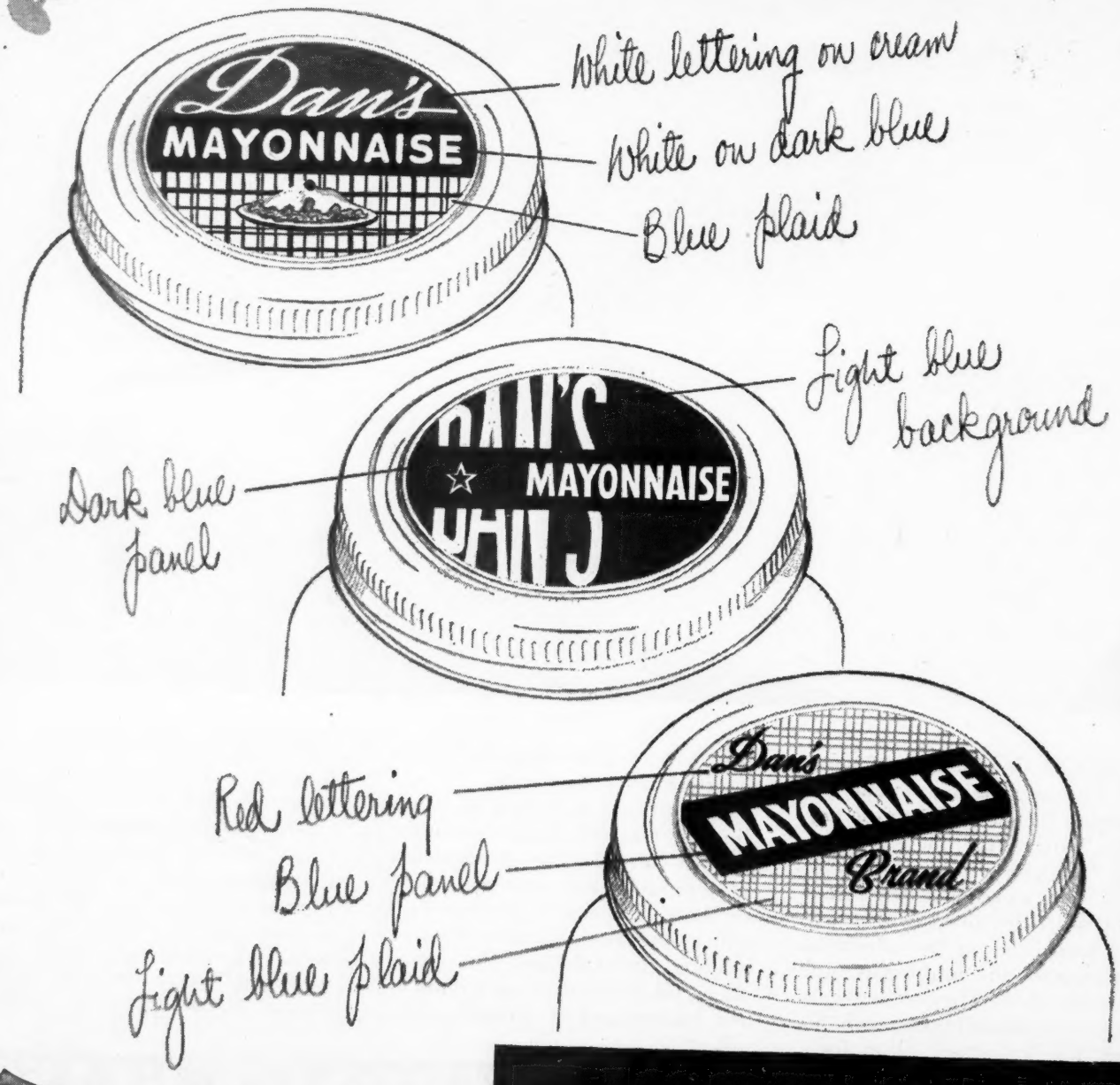
Armstrong's booklet, "Men and Glass," gives an interesting story of the patience, skill, and years of experience that go into the making of fine glass. For your free copy, write Armstrong Cork Co., Glass and Closure Div., 4202 Prince St., Lancaster, Pa.

ARMSTRONG'S GLASS *and* **ARMSTRONG'S CLOSURES**

HOW WOULD YOU RATE THESE CAPS FOR SALES-APPEAL?

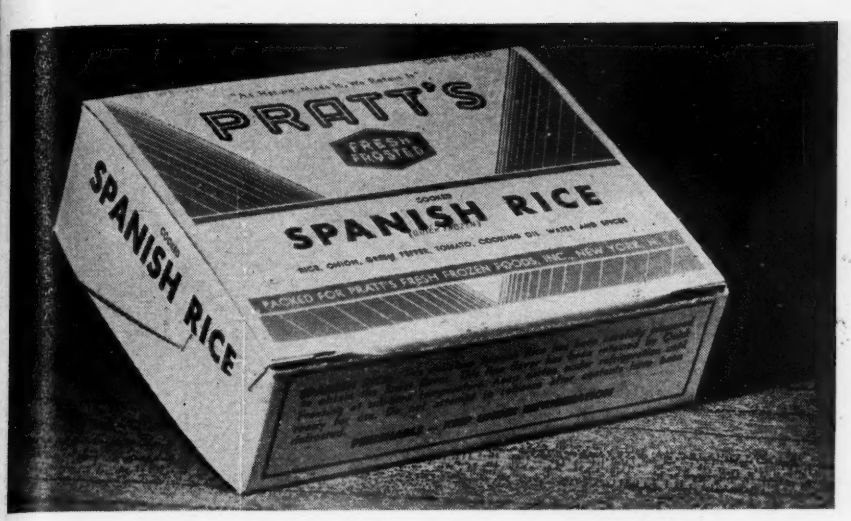
OR perhaps you have never thought of a cap as having much "sales-appeal." That big flat area on the top can do a lot of sales work for any product. It can beautify your package—help customers identify it—keep an advertisement constantly before their eyes when the cap is being used, long after the label has been washed off the jar.

We've made a sort of specialty of helping use the space on Armstrong's Metal Caps. A good many people have told us they appreciate our help—and the quality of our product. Perhaps you would, too. Just send a note along with a sample of your present package to Armstrong Cork Company, Glass and Closure Division, 4302 Prince Street, Lancaster, Pennsylvania.



Armstrong's Closures

TURN STANDARD CONTAINERS INTO STANDOUT PACKAGES



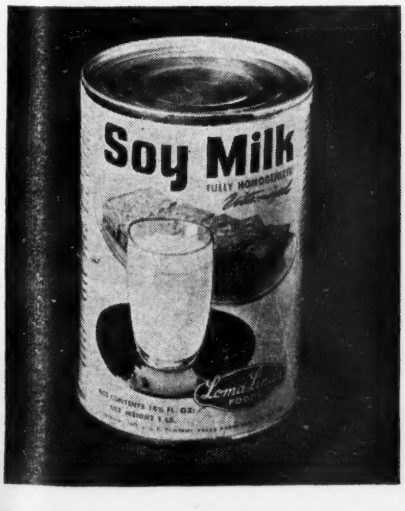
So that there is no question concerning the preparation and cooking of the dehydrated products, directions have been placed on the top inside of each container or have been printed on the sides of the package.

Cooked and Frozen

RICE, onion, green pepper, tomato, cooking oil, water and spices are the ingredients which make up Pratt's precooked, quick-frozen Spanish Rice. This frozen cooked food is packed and distributed by Pratt's Fresh Frozen Foods, Inc., New York, N. Y., in 1-lb. MAT cellophane-lined waxed cardboard cartons. The rice is cooked before it is quick frozen at subzero temperature and kept in cartons under refrigeration until ready for use.

Milk From Soybeans

"SOY MILK," a fully homogenized, vitaminized canned milk, has been introduced by Loma Linda Food Co., Arlington, Calif. Made from the soluble parts of soybeans in a water solution, together with vegetable oil, raw sugar, calcium phosphate, salt and flavorings, it contains no ingredients of animal origin but is of approximately the same chemical composition as cow's milk. The vitamin content is added in the form of carotene, thiamine, irradiated sesame oil and riboflavin. The product is ready to serve hot or cold as a food beverage or it may be employed in cooking.



A typical analysis indicates that there are 3.25 percent protein, 3.25 percent fat, 4.00 percent carbohydrates and a moisture content of 88.65 percent. The analysis also shows that a 14½-oz. can contains 1,000 International Units of vitamin A, 250 of vitamin B, 250 of vitamin D and 500 micrograms of vitamin G. The mineral content is 10.20 milligrams of calcium per liquid ounce, 15.10 of phospherous, 1.4 of iron and 0.04 of copper. There are 16.5 calories for every liquid ounce of milk.

Frozen Fudge Pudding

"FROZEN FUDGE PUDDING," a wartime frozen dessert which looks and tastes like ice cream, has been developed by Balch Flavor Co., Pittsburgh, Pa.

The new Balch product enables the ice cream manufacturer to make a new product with his present equipment, since the pudding is processed in the same manner as ice cream, and is packaged, stored and sold in the usual pint or quart ice cream containers.

When featured in brick form in a "50-50 Victory Combination" with half vanilla and half frozen fudge pudding, it allows the ice cream manufacturer to increase his gallonage despite wartime limitations on milk solids and butterfat content.

The pudding contains somewhat the same ingredients as ice cream in that vegetable oils are used in place of butterfat and edible cereal solids replace milk solids. The sugars and chocolate flavoring are about the same.

LOOKING AHEAD...

No merchandiser is fooled by the ease with which his product sells nowadays. Abnormal conditions are always temporary. That tough Buyer's Market may be just around the corner.

Buying habits are being formed today as always. Mrs. Consumer, whether consciously or unconsciously, continues to make a bee-line for Quality—and Quality is unmistakably typified by a distinctive, appetite-whetting package.

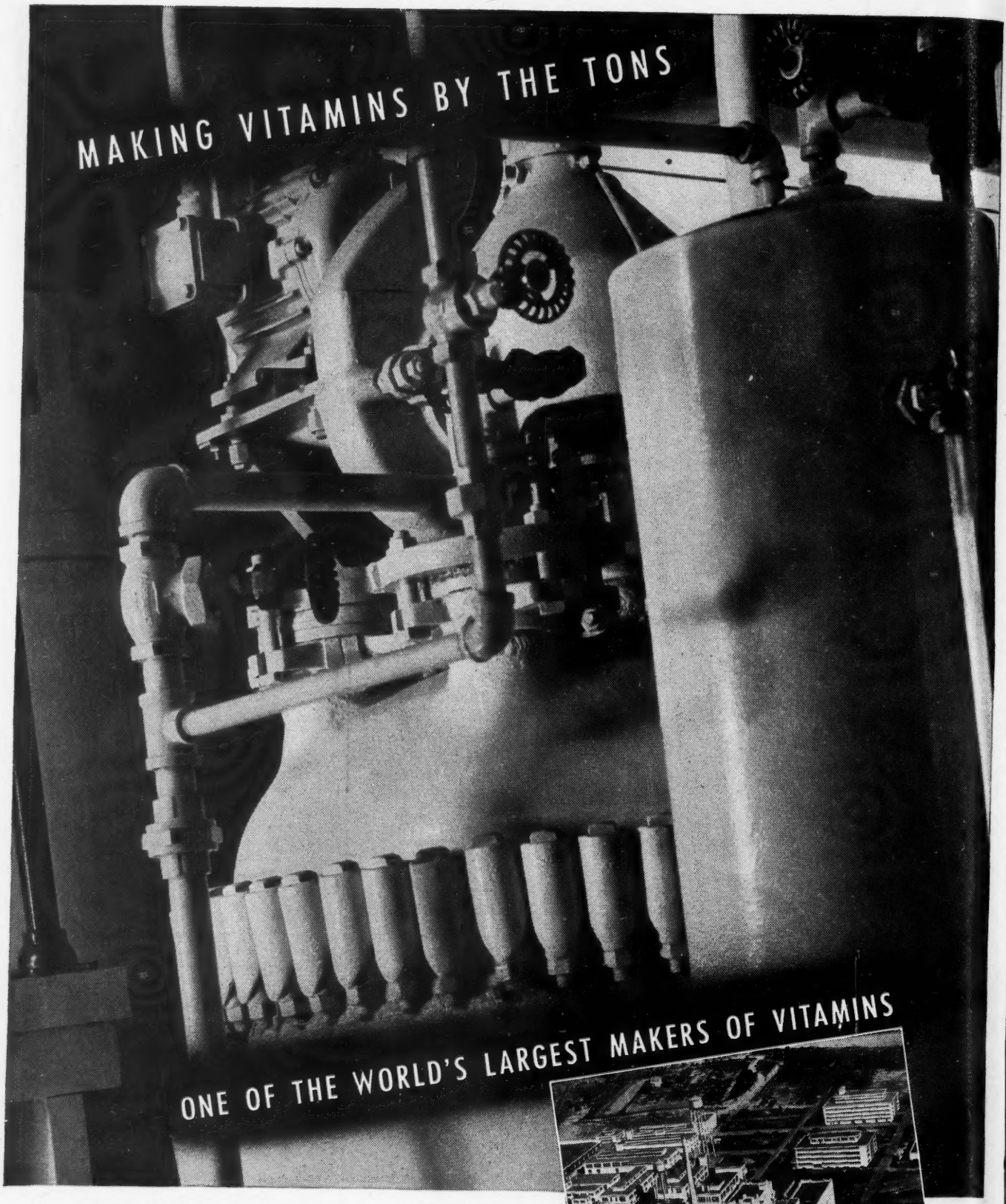
The Rossotti organization offers you a completely integrated service on fine Labels, Package Wraps and Folding Cartons—from sketch to finished product. Complete Art, Idea, and Merchandising Counsel.

Why not call in a Rossotti Packaging Man for a constructive discussion of your individual requirements? Or drop us a line at our North Bergen Plant. No obligation at any time.

ROSSOTTI LITHOGRAPHING COMPANY, INC.
NORTH BERGEN, NEW JERSEY

West Coast Division
Rossotti West Coast Lithographing Corporation
San Francisco, Cal.

Sales Representatives in Principal Cities



More and more food processors, who enrich their products with vitamins, are feeling that they are protecting their requirements best by tying up with our large production.

In addition to meeting usual U.S.P. requirements, all Roche B_1, B_2, C, etc. must pass the exacting specifications of our own laboratories. You are thus doubly insured as to highest quality.

Roche vitamins are offered in a variety of convenient bulk packings developed to provide maximum protection and ease in handling.

Quotations and technical information gladly supplied at all times.

Vitamin Division, HOFFMANN-LA ROCHE, INC., Roche Park, Nutley, New Jersey
World Famous for Fine Pharmaceutical Chemicals.

ROCHE

FOOD INDUSTRY NEWS

Postwar Plans Reflected By Expansion Reports

Seven companies prepare for heavy future demands by acquiring new holdings to broaden operations

ON THE DAY, early in January, that the press was reporting the speech of Jesse Jones, Secretary of Commerce, urging large and small business to make postwar plans now, General Foods was announcing the formation of a new operating unit within the organization to lay the groundwork for the enlarged potential to come with the war's end.

While the two announcements were unrelated, the coincidence helps to spotlight the growing emphasis which business in general is placing upon plans for the future. Evidence of this trend within the food industry was further supported as the month advanced. There were reports from such diverse organizations as Canada Dry, which revealed specific plans for the addition of ten new plants; American Distilling Co.'s announcement that it now virtually controls the Moxie Co.; General Mills' request for approval for the issuance of 20-million-dollar, ten-year sinking fund debentures in "furtherance of immediate and future plans" of the company; Armour & Co.'s purchase of ten plants in Minnesota and North and South Dakota belonging to DeSota Creamery and Produce Co.; Borden's absorption of Vonks Dairy of Grand Rapids, Mich., and Zachman's Dairy of Marion, Ohio; and Standard Brands' acquisition of Shefford Cheese Co., Inc., of Green Bay, Wis.

General Food's New Unit

The new unit formed by General Foods, as outlined by Vice-President Edwin T. Gibson, will be known as the Birds Eye–Snider division and will comprise Frosted Foods Sales Corp., Q-F Wholesalers, Inc., the recently acquired Snider and Ray Maling divisions and B. E. Maling, Inc., a subsidiary.

Burt C. Olney, formerly general manager of the Snider division, has been appointed general manager of the new organization.

The sales and production staffs of the new division include: George L. Mentley, former national sales manager of Frosted Foods Sales Corp., general manager of sales; Francis J. Tormey, previously general sales manager of the Snider division, sales manager; Ben F. Logan, Jr., formerly general manager of the Ray-Maling division, sales manager of canned fruits and vegetables; John I. Moone, formerly central division sales manager of Frosted Foods Sales Corp., sales manager of frosted foods; Joseph C. Harkins, previously assistant sales manager of the Snider division, sales manager of condiments.

Allen M. Shultz, former assistant controller of General Foods, is controller; Donald E. Barr, general manager of marketing and advertising; Howard F. Lochrie, formerly advertising manager of Frosted Foods Sales Corp., manager of advertising and sales promotion; Nathaniel B. Barclay, formerly field sales supervisor in Frosted Foods Sales Co.'s midwest division, merchandising manager; George O. Bailey, former general manager of production of the Snider division, general manager of the production department; Joseph E. Guinane, former Birds Eye production manager, production manager.

Standard Brands will operate the Shefford organization as a separate subsidiary with Frank T. Lewis, for many years vice-president of Kingan & Co., as president and Charles L. Nye as vice-president and general manager.

GEORGE O. BAILEY

BURT C. OLNEY

General Foods, in announcing the formation of the Birds Eye-Snider division, reveals that Burt C. Olney is to be general manager of the new unit while George O. Bailey becomes vice-president in charge of production.

Margarine Tax Repeal Loses in House Vote

ALTHOUGH backed by a considerable number of members of the House, a bill to relieve the margarine industry from harshly restrictive taxes lost by a narrow margin in the House Agriculture Committee. Margarine industry executives were especially disappointed in the failure of Congress to authorize either repeal or suspension of the 10 cent excess tax on margarine when it is colored.

The battle is expected to be resumed in the Senate, but observers in Washington do not believe that there is the slightest possibility of the margarine tax being suspended. These observers believe the dairy industry maintains too powerful a lobby in Washington.

No Canned Food Surplus

IN recently warning against the food processors' jitters over early peace, Walter F. Straub of OPA revealed that total stocks of canned fruits and vegetables for civilians were only about 2 percent higher than in 1942. Canners' stocks are about 18 percent higher, but needs of the armed forces will be greater in 1944.

THE PROCESSING PICTURE

Food Container Materials Continue To Be Scarce

Food packaging has completed cycle back to metal because of scarcity of wood and pulp products

CONTAINER TROUBLES have made a complete circuit. Urged for the last two years to get out of metal and into glass and particularly into paper packages, the food processors now find that there is a growing scarcity of wood, pulp products and wrapping materials which is forcing them back to metal.

Tinned metal is to be more available during 1944. This does not indicate that the supply of tin has grown easier. On the contrary, it indicates that the supply of wood and paper is comparatively tighter.

Bottles Not Plentiful

Forecasts that there will be plenty of bottles for certain industries seem to have caused great disturbances among the container specialists of Washington. They warn that there is not going to be plenty of anything in the way of packaging materials or containers. They urge the maximum possible reuse of containers of all types.

Quotas for metal and glass containers for 1944 announced early in January reflect the tight situation of all paper packaging products. In addition to permitting a number of items to be packed in metal that were not eligible under last year's order, unlimited quotas were given an increased number of food products for the 1944 pack. Lemon juice, sweet sirups, cranberries, pimientos, and boned chicken are food products that will be put up in metal this year. A small quantity of orange juice and blended orange and grapefruit juice will be packed in tin for civilian consumption.

Container Orders Combined

Schedules of M-81, the can orders are correlated with the glass container order L-103-b, which in its 1944 version includes the closure quotas which were contained in Limitation Order M-104 previously. Production of glass containers in 1944 is expected to equal or slightly exceed the 1943 production figure of approximately 92 million gross.

Generally speaking, there is little change in the quotas from last year. The provisions which discouraged the excessive use of small containers for food items have been retained in the new order.

The food manufacturers may find that their problems in securing a sufficient number of containers will be aggravated by transportation troubles.

Thin Coating of Lard Protects Frozen Meat

PROTECTION of frozen meat by a thin coating of lard is suggested by researchers of the Department of Agriculture. Where efficient wrapping material is not available in adequate quantities, it is recommended that the individual pieces of frozen meat can be protected by proper coating with a first-quality lard. The recommendation is summarized by the recent statement as follows:

How It Is Done

"Freeze the individual unwrapped steaks, roasts and other cuts to zero temperature. Dip them briefly (about 5 seconds) in high-quality lard that has been heated to about 200 deg. Remove from the lard and hold or hang the cuts for a few seconds until the thin film of lard sets on the frozen meat. Store at near-zero temperature. The thin film of lard will prevent dehydration during an 8- to 10-month freezer storage as well as would thicker coatings made from cooler lard. Cook the fat-wrapped meat as you would any other frozen cut and add the melted fat to the gravy. Caution: Low-quality lard or lard held too long in the freezer may develop a strong flavor."

British-Combine

BRITISH FOOD MINISTER

Col. J. J. Llewollin, who recently arrived in England to take up his new duties as British Minister of Food.

Higher Quotas Allowed For Food Machinery

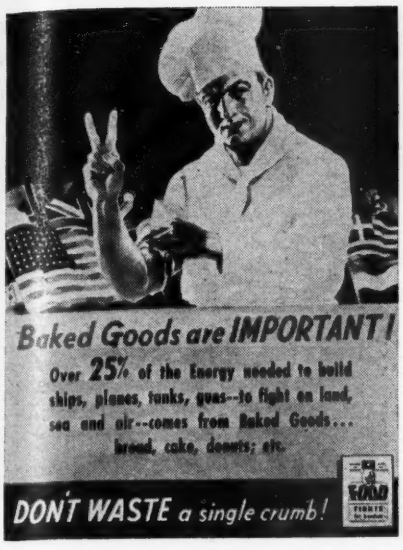
HIGHER QUOTAS for meat packing, grain milling and baking machinery have been announced by WPB. These will increase production of this material during 1944. The new quotas represent a 40 percent gain for milling machinery, while the manufacturers of meat packing equipment may use 125 percent of base period consumption. In place of the flat 50 percent for baking machinery, the amended schedule permits from 30 to 95 percent of base period consumption. The new quotas are set up as schedules II, VI and VII to Limitation Order L-292.

Processors To Meet February 13, 14, 15

THE food processors conference is now scheduled for Chicago's Stevens Hotel, February 13 to 15. The administrative council of the National Canners Association approved the dates after being advised by government officials that support prices for canning crops and reservations to be made for the government from the 1944 pack will be ready for presentation. While OPA will not be able to furnish specific prices for different commodities, they will present the method of determining canners' price ceilings in sufficient detail to enable the canner to calculate his approximate prices for 1944. The administrative council will meet February 10 and the board of directors February 12. The conference has been postponed from January 9.

Substitute for Cork Found by Research

DEVELOPMENT of a new type of cork substitute that the Agricultural Research Administration says is the equal of the cork disk used in bottling food and beverage products has been announced by the Department of Agriculture. The substitute is made of pith


Baked Goods are IMPORTANT!
Over 25% of the Energy needed to build ships, planes, tanks, guns--to fight on land, sea and air--comes from Baked Goods... bread, cake, donuts; etc.
DON'T WASTE a single crumb!

WAR POSTER

This is one of four colorful posters made available at no charge to the bakers of the country by the Doughnut Corp. of America, for posting on trucks or at key outlets.

and fiber from farm wastes, together with animal or vegetable glues and sugars, apple honey or glycerine.

The new product has been named "Norseal" and may be formed as rod or sheet material, or poured in the liquid state and allowed to set.

DISTRIBUTION

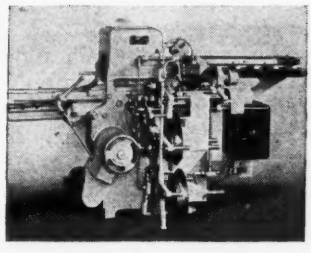
Cold Storage Problem Stirs Agency Action

COLD STORAGE and freezer space can no longer be counted on as a balance wheel for food processors' operations. How long the tight situation will exist is at present problematical. WFA, OPA and ODT have been working feverishly to relieve the condition, spurred by charges of food hoarding against the armed services and WFA, with resulting food spoilage, and by the threat of Congressional investigation.

During the five-year period 1937–41, the average occupancy of freezer space was 801,000,000 lb., according to Joseph B. Eastman, director of ODT. On Dec. 1, 1943, the occupancy of freezer space had gone up to 1,461,000,000 lb. This covers frozen fruits and vegetables, frozen meats, frozen poultry, frozen eggs, frozen cream and butter.

Early in January the tight storage condition became the subject of comment in Washington newspapers. One of the results was an attempt by the WFA to clear its skirts by issuing a statement showing the total quantity of certain items in commercial storage and the amount of the total owned by

One phase of post-war planning ON WHICH YOU CAN ACT NOW



FLEXIBILITY—a quality to look for in post-war wrapping machines

Most of our machines are quickly adjustable for more than one size of package, and are adaptable to *any type of wrapping material.*

This extreme flexibility has proved of immense value to package goods manufacturers in adjusting their packages to wartime requirements...It will prove equally valuable in meeting the changing conditions which will inevitably be encountered in the post-war period.

THERE are parts of your post-war plans that can remain largely in the blue-print stage till the war is won...But there are other things that call for action now, if you don't want to be caught at the end of the line.

NEW MACHINERY is one of these.

Forward-looking executives appreciate this. It explains why many concerns have already made arrangements with us for the building of an impressive number of new wrapping machines just as soon as civilian needs can be given the green light.

It's not so difficult to take care of this part of your post-war planning as you might think ...Our salesmen are experienced in various phases of plant production as it relates to packaging. With their help, and the assistance of our engineering department, you will most likely be able to plan your improvements and replacements with such assurance that you can definitely determine the type of wrapping machines you will require, and we in turn can plan to meet your needs. Months of costly delay in putting production and selling plans into action may thus be avoided.

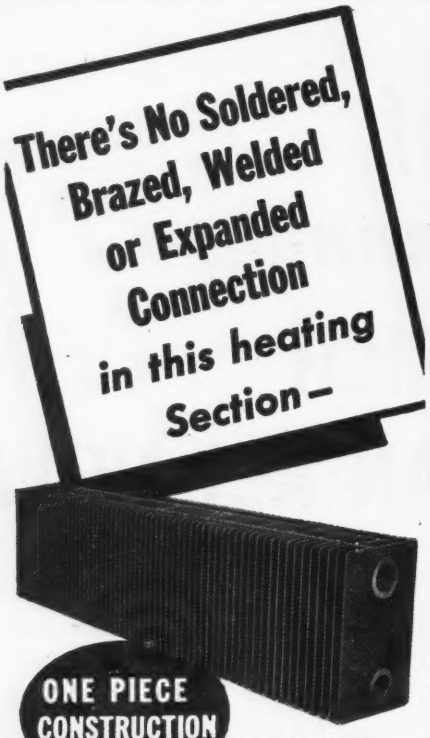
We'll be glad to study this subject with you —no obligation, of course. Write or phone our nearest office.

ARMY E NAVY

PACKAGE MACHINERY COMPANY
Springfield 7, Massachusetts

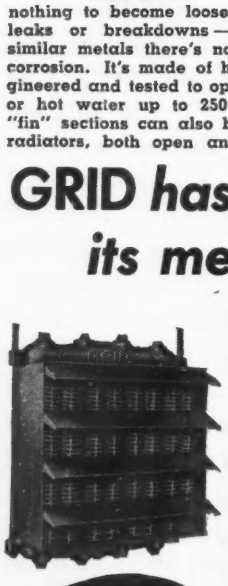
NEW YORK CHICAGO CLEVELAND
LOS ANGELES TORONTO

PACKAGE MACHINERY COMPANY
Over a Quarter Billion Packages per day are wrapped on our Machines



In the GRID condenser "fin" section shown here there's nothing to become loose — nothing to develop leaks or breakdowns — and being made of similar metals there's no electrolysis to cause corrosion. It's made of high test cast iron, engineered and tested to operate with either steam or hot water up to 250 lbs. pressure. GRID "fin" sections can also be adapted for use as radiators, both open and convector type.

GRID *has proven its merit—*



ON HIGH PRESSURES • FOR 14 HEATING SEASONS WITHOUT FAILURES

CAST IRON HEATING SECTIONS

Why install a unit heater that will lose its efficiency within a short period, when you can get GRID for permanency? GRID Unit Heaters are built to outlast other types of heating equipment, because no other unit heater has its lasting qualities. Capacity tables and complete information upon request.

D. J. MURRAY MANUFACTURING CO.
WAUSAU, WISCONSIN
Offices in Principal Cities

GRID UNIT HEATER

DISTRIBUTION DIRECTOR

M. Lee Marshall, chairman of the Board of the Continental Baking Co., is the newly appointed director of food distribution for the War Food Administration. Mr. Marshall comes to WFA, on leave from his company, to succeed Roy F. Hendrickson.

UNRRA EXECUTIVE

Roy F. Hendrickson relinquishes his post as WFA director of food distribution to become deputy director general in charge of supplies for the United Nations Relief and Rehabilitation Administration. The appointment became effective January 15.

the WFA. But nowhere is to be found any information on the amount of space leased by the armed services. This space is not considered as commercial storage in reports to the government. Nor is there any indication of the amount of space the armed forces are using as regular commercial customers, which would be included in the total.

Food stocks held in storage by WFA and by private owners on December 1 were announced by WFA on January 6. The military stocks were not disclosed, but were declared not to be excessive.

These stocks by commodity groups are:

Canned Meats—WFA stocks, 246 million pounds, approximately 3½ months' supply as compared with the rate of delivery in December, but the present stocks will be exhausted before February 15 at the present rate of shipment.

Evaporated Milk—Privately owned stocks, 5 million cases, about a three-month supply at the rate of shipments made last year.

Canned Fruits and Vegetables—Processors' and wholesalers' stocks, about 140 million cases; WFA stocks, about nine million cases, about a seven-month supply compared with quantities shipped last month.

Grades on Invoices Dropped by the OPA

THE OPA announced that its requirement that canners show on their invoices to wholesalers the grade of the product being sold applies only to such of the 1943 pack as has been given dollars-and-cents prices regionally under Department of Agriculture grades.

Priced in this manner are ten principal packs—tomatoes, snap beans (both green and wax), corn, peas, spinach, grapefruit juice, asparagus, turnip greens, mustard greens and red sour cherries. These constitute about 50 percent of the total 1943 pack of all canned fruits and vegetables.

Outlook Gloomy for Food Truck Users

ANNOUNCEMENT that 80,000 new trucks of the 1,000,000 truck production quotas for 1944 would be available for sale to civilian users means little to the food industry, even though producers, processors and distributors of food will have first call. The number of trucks available for civilian purchasers may be even less than the contemplated 80,000, since every island taken by our forces in the Pacific means that the Army must have more trucks. Transport for any invasion of the European continent will be by trucks produced in this country. Reports are that we are already delivering 10,000 trucks a month to Russia, and every additional mile that they penetrate into German-held territory will bring needs for more trucks.

Government officials in touch with the problem believe that the only salvation of the food industry is: (1) Through greater conservation of existing vehicles. (2) Greater utilization of these vehicles. (3) The requisitioning of trucks now being used for nonessen-

tial operations for essential uses which ODT can do under present regulations. (4) The conversion of additional manufacturing facilities to the manufacture of trucks.

The outlook for this year is gloomy unless truck owners will follow an aggressive program to make their present equipment last through the emergency. It does not look as if an appreciable amount of new trucking equipment will be available for civilian use before 1945.

RAW MATERIALS

Edible Oil Allocation Cut by Government

No particular inference can be drawn from the FDA authorization for the use of only 10,608 tank cars of edible oils—cottonseed, peanut, soybean and corn—by the oil refiners, shortening and margarine manufacturers for the first quarter of 1944. Although the number of cars authorized is over 1,100 less than was authorized for the last quarter of 1943, the action was based on the formal application of users, received prior to January 1.

The fact that there was an increase in the number of tank cars of soybean oil and a decrease in the number of cars of the other oils authorized directly reflects the supply situation.

The decrease in the number of cars of peanut oil authorized for use is in line with the crop situation. For months crop reports have shown a steady decline in the supplies of peanuts available for crushing. The decline has been variously attributed to increased feeding of peanuts and to the increased manufacture of peanut butter to bolster the short supply of spreads.

Urge Dixie Cabbage For Sauerkraut Use

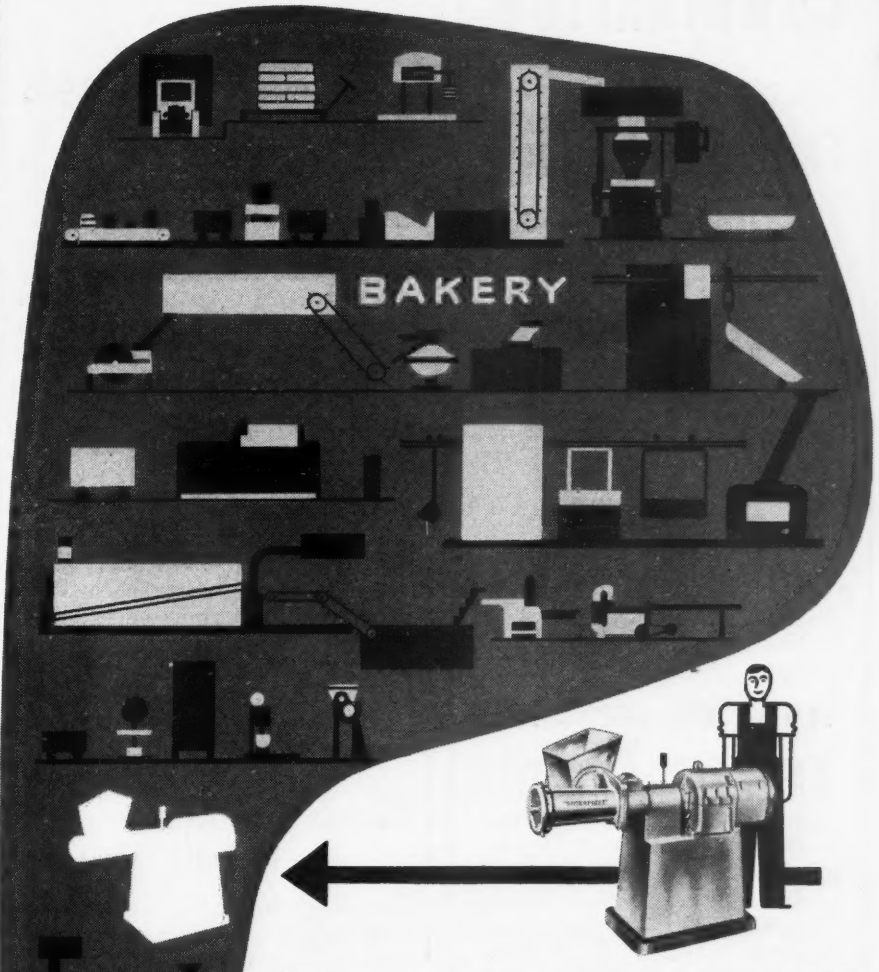
The War Food Administration is urging the sauerkraut packers to take advantage of the record production of cabbage in the southern states and California, as a means of overcoming the present shortage of sauerkraut.

Present supplies of kraut for civilians are negligible, declares WPB, and arrangements to move cabbage supplies from the southern areas to the kraut making plants or of temporarily transferring at least part of the operations to the producing areas, will go a long way toward meeting the demand.

The suitability of southern cabbage for kraut can be greatly improved, says the agency, by packers arranging with

If you bake a line of fruit and nut sweet goods

here's where we come in!



Fruits aren't easy to cut, especially those with high sugar content . . . yet the "Enterprise" Master Chopper gives exactly the reduction you want, without difficulty. Does an outstanding job on nuts, too.

Not only bakers and pastry chefs—but ice cream manufacturers, meat packers, mince-meat makers, canners . . . all have proved that "Enterprise" Choppers help turn out a better product at a *lower installation, operating and maintenance cost.*

"Enterprise" welcomes special food reduction problems. Our experts have been solving them for three quarters of a century. We shall be glad to help you.

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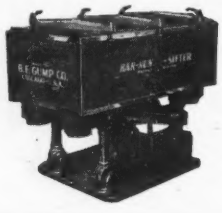

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growers to have the cabbage remain in the fields longer than usual to gain full maturity. This would also increase tonnage and financial return from the crop.

Smaller Hog Crop Predicted for 1944

SMARTING from the troubles experienced in marketing the record 1943 output of hogs, farmers are expected to sharply decrease hog production this year. In fact, the Department of Agriculture expects the 1944 crop to be around 16 percent lower than the 121,847,000 head produced in 1943, or in the neighborhood of 103,000,000 head.

In view of the tight situation in animal feedstuffs, which is likely to continue throughout most of this year, it is perhaps fortunate that hog production is to decrease. With less demand upon corn and other feeds from hog raisers, some relief may be expected by dairy interests and by cattle feeders, both as to price and availability of basic animal feeds. Perhaps, also, this drop in hog numbers may make poultry feeds more available. decreasing the pressure on egg and poultry producers to reduce flocks.

Sugar Situation Is Still Doubtful

CONTINUED failure to reach agreement with Cuban sugar interests as to the price of blackstrap molasses indicated at mid-January that the sugar situation was likely to remain tight through the first half of 1944.

As forecast in FOOD INDUSTRIES for January, 1944, pressure from livestock and other interests to reduce the quantities of grain used in alcohol production has brought more emphasis on sugar and molasses as raw materials for alcohol. Already, some large alcohol plants have switched back from grain to sugar. And, with the molasses supply still in doubt, the raw material for these plants is likely to be edible sugar rather than blackstrap.

Consequently, in spite of the availability of ample sugar to meet all food demands, strict rationing, perhaps even stricter than heretofore, may be expected during the first half of this year.

Spice Importations Show Increases

ACCORDING to recent reports of the American Spice Trade Association, the supply situation in imported spices is the most favorable since Pearl Harbor. In fact, this group indicates that there are now ample stocks of all spices except cinnamon.

Even with cinnamon, trade figures indicate that the situation is not hopeless. Cut off from supplies of cassia from China, we have had to depend upon true cinnamon from Ceylon. Consequently, supplies are only about 25 percent of normal. But various synthetic cinnamon substitutes serve to extend this supply, when blended with cinnamon oil.

Domestic mustard is now able entirely to take the place of this formerly imported spice. Imports of vanilla from Madagascar are now about normal, as are imports of cloves from Zanzibar.

Caraway and poppy seed are coming from Russia; cardamom from Mexico; allspice, nutmeg and mace from the West Indies; ginger from Africa and the West Indies; thyme from Mexico and South America; and sage from domestic sources. Other sources have been found to substitute, at least in large part, for other spices formerly imported from war-bound areas.

The one black spot is pepper. While it is true that a two-year supply of pepper, under rationing, is available in

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this country, the marketing of this supply and the importation of fresh supplies from India, are blocked by a controversy over ceiling prices. It is to be hoped that some agreement on this price situation is reached before packers' supplies of pepper run out.

Larger Fishery Output In Prospect for 1944

In a recent statement, Coordinator of Fisheries Harold L. Ickes stated that larger supplies of fish and fishery products can be expected this year than last. Output as high as, and possibly higher than 4,000,000,000 lb. is forecast. This would be greater than production in either 1942 or 1943, though still below normal production of 4,400,000,000 lb.

Expectations of increases are based largely on the fact that more fishing vessels are available for 1944 operations. Since July 1, 1943, materials have been allotted for the construction of 528 fishing vessels of all types. Of these, 261 were scheduled for completion before the end of 1943, the remainder this year. In addition, the armed forces have turned back to the industry some of the over 700 fishing vessels taken over early in the war.

More Truck Crops Expected This Year

Acreage for eight important truck crops is expected to be much greater this year than last. "Planted or intended" acreage of cabbage, spinach, lettuce, carrots, onions, cauliflower and celery is expected to exceed 1943 totals by at least 23 percent and to be as much as 32 percent over the ten-year average. These crops are for fresh-market shipment. Figures for "planted or intended" acreage of crops for processing are not yet available, except for a few winter crops.

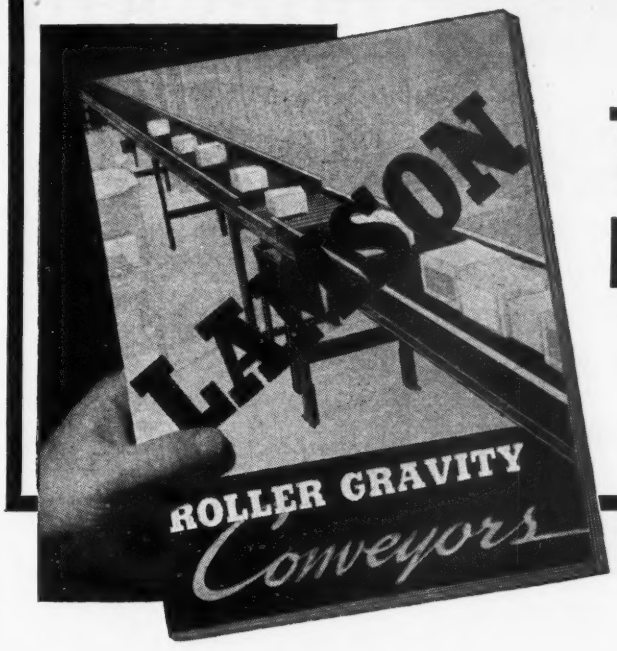
SCHEDULE OF EVENTS

FEBRUARY

7–11—Dairy Conference, Ohio State University, Columbus, Ohio.
7–17—Canners' and Frozen Food Packers School, Oregon State College, Corvallis, Ore.
14–26—Pennsylvania State College, 53rd annual ice cream short course State College, Pa.
28-March 11—Pennsylvania State College, short course in market milk, State College, Pa.

MARCH

6– 9—American Society of Bakery Engineers, 21st annual meeting, Edgewater Beach Hotel, Chicago, Ill.
28–31—Packaging Conference and Exposition, sponsored by American Management Association, Palmer House, Chicago.
30–31—Wisconsin Dairy Manufacturers, annual conference, Department of Dairy Industry, University of Wisconsin, Madison, Wis.



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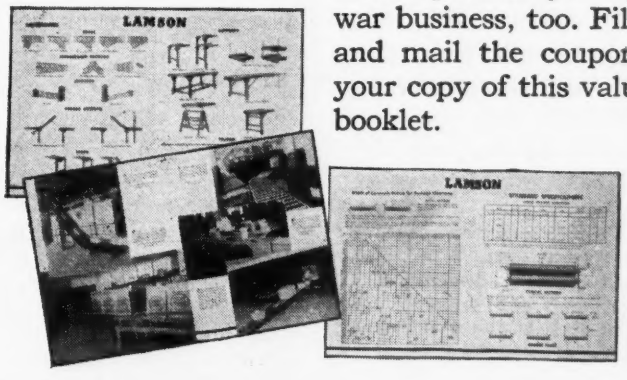
TELLS YOU . . . how to move your products faster, more efficiently, more economically. In war-busy food warehouses and processing plants, Lamson Roller Gravity Conveyors are eliminating waste motion, adding to the productivity of manpower, reducing costs, and providing better control of stock. Let us show you how Lamson Roller Gravity Conveyors can take an active part in your post-war business, too. Fill out and mail the coupon for your copy of this valuable booklet.



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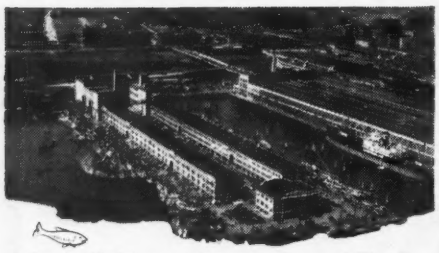
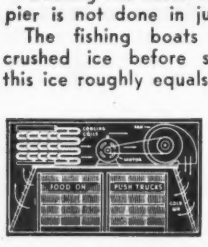


12 Million Pounds of Fish *-Sold without Rationing-* Handled Monthly at Boston Fish Pier with FRICK Refrigeration

Cooling the catch at the world's largest fish pier is not done in just one operation.

The fishing boats must be loaded with crushed ice before sailing. (The weight of this ice roughly equals seven-tenths the weight of fish brought in.)



1,500,000 lb. of fish is quick-frozen per week.

From 50 to 80 per cent of the catch is quick-frozen, at a temperature of 30 deg. F. below zero. Standard Frick-freezing equipment is used.

The vast storage rooms, kept at zero, will hold 15 million pounds of seafood.

For icing railway cars, and the packages of fish in dealers' stalls, 110 more tons of ice are made per day.

Refrigerators, precoolers, research work, air conditioning, and special processes call for additional "cold."

All these services are supplied by the Commonwealth Ice and Cold Storage Co., at the head of the Pier, where Frick Refrigeration has been used exclusively ever since the great plant was built in 1914. Wm. D. Dunbar, Chief Engineer at the Commonwealth plant, says, "Frick Equipment handles the heaviest loads with dependability and economy."

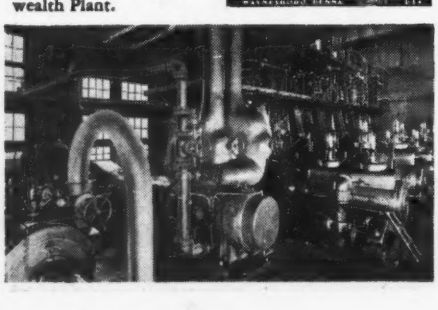
There are 70 cold storage rooms on the Pier, (some of great size.)

250 Tons of ice are required per day.

Dealers, railway cars, trucks, and trawlers require ice.

Below: Some of the Frick Refrigerating Machines at the Commonwealth Plant.

FRICK CO.



INDICATORS

Raw Materials

Flour production in December, 1943, by mills representing 73 percent of United States output, was 15,890,847 sacks, according to *The Northwestern Miller*, compared to 15,145,598 sacks in the preceding month.

Sardine pack in Maine, in 1943, of 2,383,506 cases, was the third largest on record since 1903.

Cocoa beans imported into the United States in 1943 are estimated to total 4,237,187 bags. This compares to around 1,500,000 bags imported in 1942.

Meat production for 1943 is estimated at a total of 24,150,000,000 lb., a new record and 12½ percent above production in 1942, according to The American Meat Institute. The same estimate forecast 1944 meat production at 25,600,000,000 lb.

Vegetables produced for processing in 1943 are reported by the U. S. Department of Agriculture as having totaled 4,981,200 tons, compared to 5,817,900 tons in 1942. The most significant drop was in tomatoes, off from 3,166,800 tons in 1942 to 2,645,600 tons last year.

Egg production by farm flocks in 1943 totaled 53,986,000,000 eggs, a new record that was 12 percent above 1942 and 46 percent above the ten-year average, according to the Bureau of Agricultural Economics.

Young chickens on farms on January 1, 1944, were reported by the Bureau of Agricultural Economics to number 413,486,000 birds, a new record that was 11 percent more than in 1943 and 46 percent above the 1933-1942 average.

Chicks hatched by commercial hatcheries in November, 1943, totaled 23,533,000 birds, compared to 25,396,000 birds in November, 1942, and to a 1938-1942 November average of 18,188,000 birds. The 1943 January-November cumulative total was 1,405,820,000 birds, compared to 1,170,710,000 birds hatched in the same months a year earlier.

Production

Butter, creamery, produced in November, 1943, was reported by the Bureau of Agricultural Economics at 92,965,000 lb., compared to 106,023,000 lb. in November, 1942, and to a 1932-1941 November average of 110,826,000 lb.

Butter, creamery, produced in the first eleven months of 1943 was reported by the Bureau of Agricultural Economics at 1,588,175,000 lb., compared to 1,639,295,000 lb. in the corresponding months of 1942, and to a 1932-1941 average of 1,616,134,000 lb. for the period.

Cheese, American, produced in November, 1943, was reported by the Bureau of Agricultural Economics at 41,340,000 lb., compared to 42,341,000 lb. in November, 1942, and to a 1932-1941 November average of 31,580,000 lb.

Cheese, American, produced in the first eleven months of 1943, was reported by the Bureau of Agricultural Economics at 729,800,000 lb., compared to 880,167,000 lb. in the corresponding period of 1942, and to a 1932-1941 average of 481,336,000 lb. for the period.

Milk, evaporated, produced in November, 1943, totaled 155,999,000 lb., compared to 165,956,000 lb. in November, 1942. The January to November, 1943, cumulative total was 2,906,948,000 lb., 13 percent below production in the corresponding 1942 period.

Milk, condensed, all kinds, produced in November, 1943, totaled 50,294,000 lb., compared to 50,201,000 lb. in November, 1942. The January-November, 1943, cumulative total was 784,109,000 lb.

Milk, dried whole, produced in November, 1943, totaled 7,500,000 lb., compared to 4,690,000 lb. in November, 1942. This was an increase of 260 percent over the 1937-1941 average November production. For the first eleven months of 1943 the output of dried whole milk was 114,650,000 lb., an increase of 103 percent over output in the same months of 1942.

Milk, dried skim, all kinds, produced in

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CONSTRUCTION NEWS

	Pending (thousands)	Awarded December (thousands)	Total Awarded 1943 (thousands)
Bakery	.....	.....	$40
Beverages	$160	.....	60
Canning and Preserving	40	.....	310
Cold Storage	270	$190	730
Confectionery	.....	.....	40
Grain Mill Products	100	.....	2,232
Ice Manufactured	.....	40	40
Meats and Meat-Products	110	.....	52
Milk Products	260	.....	1,53
Miscellaneous	330	.....	4,356
	$1,270	$230	$9,864*

*Complete 1943 total

November, 1943, totaled 18,500,000 lb., compared to 31,186,000 lb. in November, 1942, and 25 percent below the 1937-1941 November average. For the January-November period of 1943 output was 453,886,000 lb., a decrease of 23 percent below production in the same months of the preceding year.

Eggs, dried, produced in November, 1943, totaled 22,068,000 lb., compared to 19,509,000 lb. produced in November, 1942.

Eggs, liquid, produced in November, 1943, for direct consumption, freezing and drying, totaled 46,857,000 lb., compared to 45,925,000 lb. produced in November, 1942.

Distribution

Tea consumption in the United States, now set at over 75,000,000 lb. per year by WFA, is expected to be increased during 1944 to near the normal consumption figure of 100,000,000 lb. per year.

Beans, dry, allocated for civilian consumption in 1944 by WFA total 1,150,000,000 lb., considerably more than average consumption in recent years.

Coffee roastings in the United States in 1943 are estimated by the Inter-American Coffee Board at close to 12,400,000 bags, about the same as in the previous year.

Indexes

Business activity index of *Business Week* for January 8, 1944, stood at 242.6. A month earlier this index was 243.4 and for the corresponding week in January, 1943, this index was 221.5.

Weekly wholesale food price index of Dun & Bradstreet was $4.00 at the end of 1943, compared to $4.02 a year earlier.

Wholesale food price index of Irving Fisher was 122.3 on January 14, 1944, compared to 118.7 on January 15, 1943.

Cost of living index of National Industrial Conference Board was 103.9 in December, 1943, compared to 103.7 in November, 1943, and to 101.1 in December, 1942.

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You can guard against this invisible menace in your plant with HTH products—HTH, HTH-15 and Lo-Bax. They are full-strength chlorine sterilizers in convenient dry form. When added to water, they form dependable, fast-killing hypochlorite solutions that make short work of bacteria. What's more, HTH Products not only minimize spoilage losses . . . but they safeguard the purity and quality of your food products. And they're as economical as they are effective. You can use them freely to flush, spray or wipe all surfaces with which food and beverages come in contact; also for general sanitation throughout the plant.

HTH Hypochlorite solutions are an effective germicide for use on floors, in locker rooms and cafeterias.

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OPA Price Regulations

Inventory Adjustments—A specific method to be followed by wholesalers and retailers of rationed meats, fats and oils and dairy products who need temporary adjustment of inventories because of seasonal variations in their volume of business is outlined in amendment 98 to RO, 16 effective January 19.

Flour—When flour millers establish their delivered ceiling price by adding the appropriate freight rate and the 3 percent transportation tax to their milling maximum, they should round out their price to the nearest full cent, following amendment 1 to RMPR 296.

Sugar—Primary distributors of direct consumption sugar were authorized by Order 11 to Revised Price schedule 60 to determine their maximum price for granulated sugar packed 35 lb. net in 5-gal. square tin cans by adding a differential of 90 cents per 100 lb. net to the maximum basis price.

Processed Foods—Upward adjustments of maxumum prices under certain conditions where wage increases have been approved by the War Labor Board or have been required under the Fair Labor Standards Act are permitted by amendments to six regulations. The regulations affected are MPR's 306, 409, 473, 488, 493 and 498, which cover most canned fruits and vegetables and their juices, frozen fruits, berries and vegetables, fruit preserves, jams and jellies, pickles and certain pickled products, dried and processed apples and apple products, and apple butter. These amendments, effective December 31, list the states in which processors are entitled to price adjustments and provide state by state and commodity by commodity a specific percentage markup which can be used to obtain the authorized wage adjustment.

The markups range from ½ to 6 percent. For flat-priced items under MPR's 306 and 493, the markups may be applied by all processors, but for formula-priced items in all the regulations only processors who petitioned OPA are affected by the amendment.

Ice Cream—Maximum prices now in effect for ice cream and ice cream mixes have been extended to February 23 by amendment 39 to MPR 280, pending permanent action on the pricing of these commodities.

Bakery Products—Provisions to overcome miscalculations in the filing of ceiling prices by baked goods producers are made in amendment 10 to MPR 319. It was made clear that whenever a maximum price is apparently based upon miscalculation or appears to be excessive, the OPA may require the seller to file evidence of the price as calculated and reported, after which the maximum price may not be changed except by written consent of OPA.

Bakers selling cakes, pies, doughnuts and sweet yeast-raised goods directly to consumers must take as their maximum price the price for which the same article may be sold by a retailer whom the baker had supplied with the item. As embodied in amendment 9 to MPR 319, this provision ends present confusion.

Grape Jams and Preserves—November and December, 1943, and January, 1944, are established, in amendment 5 to MPR 473, as the base period that manufacturers must use for working the formula establishing maximum prices for grape jams and preserves from packed Concord grape juice or pulp from the 1943 crop. The amendment became effective on January 13.

Fats—Renderers of household waste fats are given until the 20th of each month to file reports showing the total amount of fats they acquired during the previous month in amendment 97 to Ration Order 16 effective January 16.

Wheat—Ceiling prices for sales of all classes of wheat by producers and all other distributors are established, in RMPR 487, at levels that reflect at least 100 percent of parity without taking into consideration subsidy payments made to wheat growers.

Sugar—Increased amounts of sugar required for shipment overseas under Lend-Lease from the New York and Philadelphia refinery areas will be provided through changes in the territories served by refinery centers, according to an OPA announcement issued January 3. The changes will increase supplies at shipping points by reducing the civilian territory formerly served by the New York and Philadelphia refineries. Boston refineries will now serve part of this territory and sugar will be moved in from the Gulf area where supplies have improved considerably.

Cottonseed Products—A complete revision of MPR 444, effective January 5, clarifies preceding amendments and brings them together in a single document. There is only one substantial price change—that of $7 per ton for whole pressed cake and meal which applies to all levels of distribution. There were also a few minor changes.

Frozen Fish and Seafood—The markup previously allowed primary wholesalers in distribution of Atlantic Coast smelts is eliminated by amendment 10 to MPR 364, effective January 8. This action means that the importer cannot add any markup to the base price in sales to other wholesalers. Two other changes made by the amendment are designed to prevent pyramiding of markups in the distribution of other frozen fish and seafood.

Poultry—The regulation pricing poultry in sales prior to retail is again postponed, by amendment 23 to RMPR 269, this time to February 15. The delay allows various sections of the industry a further chance to reconcile differences of opinion.

Processed Foods—To permit processors to build up reserves of processed foods for use next spring, the wholesale inventory factor for the reporting period beginning January 30 and ending March 4 is cut to 4 by amendment 35 to Revised Supplement 1 of Ration Order 13, effective January 7. The new factor will enable wholesalers to carry a larger supply of processed foods, which will be needed in the spring when the production of processed foods is at a seasonally low ebb.

Sugar—A reduction of two cents per 100 lb. in the maximum price for off-shore raw sugar delivered at the port of Boston is effected by amendment 4 to RPS 16. This brings the price to $3.74 and equalizes the Boston ceiling with that prevailing at the port of New York.

Bananas—Adjustments, not to exceed 35 cents per hundredweight, may be made in the wholesaler's maximum price for bananas where hauling between the customary receiving point and place of business or ripening facilities is necessary, according to amendment 5 to MPR 285. No adjustment may be made, however, which will increase the price at retail or that will cause a shortage in another area.

Live Hogs—Dealers reselling hogs at public stockyards were authorized to collect a normal service charge, by amendment 3 to MPR 469, even when the result is to bring of the hog above the stated maximum. This action was taken to ease a situation where the original regulation caused some conflict with the Packers and Stockyards Act of 1921.

WPB Orders

New Glass Containers—The 1944 quotas for new glass containers, as well as metal caps, remains about the same as those used in 1943, according to Limitation Order L-103-b issued on January 4. The new order incorporates the metal closure Limitation Order M-104, which is revoked. Only new glass containers and caps are covered by the new order, and their reuse is not affected. Subject to specific exceptions, the order lists the products that may be packed in glass containers, along with the closure material that may be used. An amendment to schedule C of L-103 permits packers of mustard to use any type of glass container manufactured prior to Mar. 20, 1944, instead of Dec. 20, 1943.

Multiwall Paper Sacks—Comprehensive standards covering design, strength and other factors involved in the makeup of multiwall paper sacks are defined for the first time in the new Federal Specification UU-s-48, recently announced by WPB and effective January 1. These specifica-

ons apply for all government and many commercial purchases and are expected to relieve the current bottle-neck in steel, fiber and wooden drum shipping containers, while also providing large savings in cost.

Wooden Containers—Quota restrictions on the use of new wooden containers for the shipment of cantaloupes, melons, carrots, cauliflower, celery, cucumbers, lettuce and radishes will not be effective until April 1. Postponement from the original date of January 1 is effected by an amendment to Limitation Order L-232, effective January 3, and was made necessary because many crops had been planted before the vegetable container restrictions were issued.

Table II of the Order lists the dimensions permitted in wooden shipping containers for fresh fruits and vegetables. The quotas to be imposed after April 1 are based on the 1942 calendar year and the percentages are as follows: Cantaloupes and melons, 80; carrots, 100; cauliflower, 80; celery, 80; cucumbers, 50; grape juice, 50; grapes (Thompson, Muscat, Sultana, Zante Currant, 100; grapes (all other varieties, 110; lettuce, 80; radishes, 50.

Metal Containers—Lemon juice, sweet syrups, cranberries, pimientos and boned chicken are among the new items that may be packed in metal containers in 1944, by Conservation Order M-81, schedules I, II and III, as amended. A small quantity of orange juice and blended orange and grapefruit juice may also be packed in cans this year, whereas none of these products was so packed for civilian use in 1943.

The following are typical items given unlimited 1944 quotas:

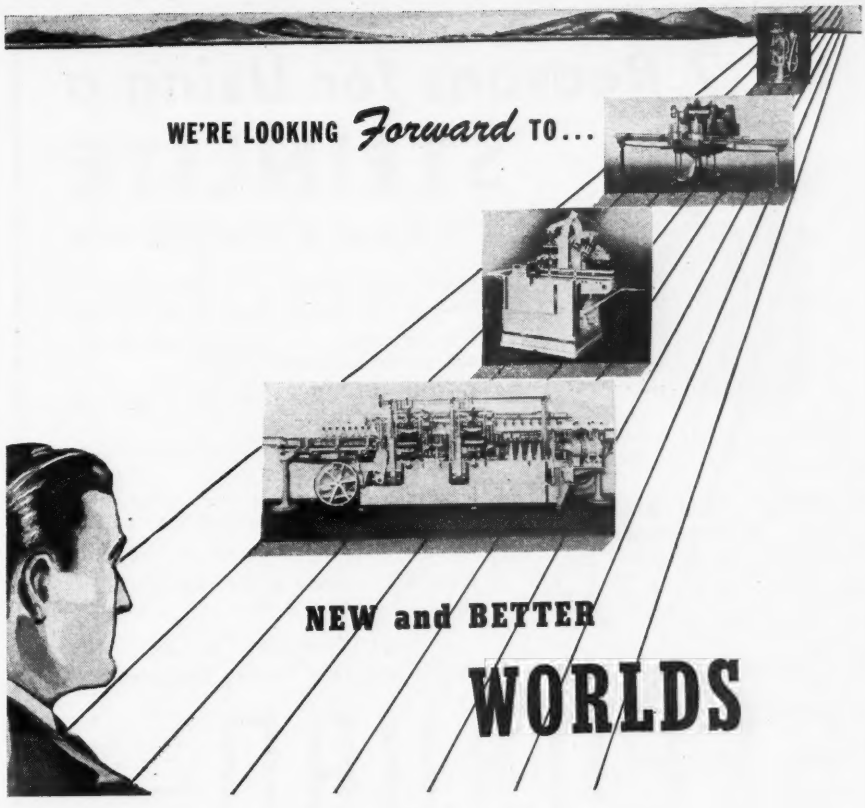
Apricots, whole apricots not to be packed unless fully ripe and 12 or more to the pound; cherries; figs (Kadota); grapefruit juice; peaches, halves, slices or cubes; pears, halves, slices, or cubes; pineapple, slices, chunks, crushed or tidbits; pineapple juice; asparagus, all-green or culturally bleached; beans, green or wax; corn, fresh, sweet, cut cream style or whole kernel; peas, green; tomatoes; tomato juice, containing no other vegetable juices; pectin, liquid only.

The following are typical items given 1944 quotas of 100 percent of a base period (base periods shown within parentheses):

Apples, including crabapples (whole apples not to be packed) (1942-43); apple sauce, including sauce from crabapples (1942-43); prunes, fresh Italian (1943); okra (1943); tomatoes and okra (1943); pumpkin and squash (1943); spinach (1942); other green leafy vegetables limited to beet, collard, dandelion, kale, mustard, poke, and turnip greens (1942).

Following are other typical items:

Cherries, RSP, frozen only, 50 percent of total frozen tonnage packed in all containers in 1942; orange juice, 75 percent, 1941-43; orange-grapefruit juice blended (50 percent orange, 50 percent grapefruit), 145 percent, 1941-42; lemon juice, 50 percent, 1941; olives, ripe and greenripe, 25 percent, 1941-43; carrots (whole carrots not to be packed), 150 percent, 1942; mushrooms, 50 percent, 1941-43; whole hams, 75 percent, 1941; tongue, 125 percent, 1942; turkey, boned, and chicken, boned, 50 percent, 1941; baby foods, 125 percent, 1943; liquid edible oils, including only animal, vegetable, olive, fish and other marine animal and edible blends of such oils, 150 percent, 1943 pack of 5-gal. size, 125 percent, 1943 pack of 1-gal. size in cans and glass.



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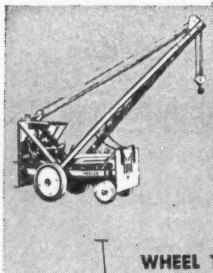

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Metal Strapping—Appeals from restrictions on metal strappings for shipping containers may now be filed in regional field offices of WPB as a result of an amendment to Conservation Order M-261. Heretofore, such appeals had to be filed with the Containers Division of WPB in Washington.

Yeast—Because of the increasing demand from both the armed forces and civilians for fresh and nutritional yeast, the quantity of molasses permitted for yeast manufacture is raised from 120 percent to 130 percent of each manufacturer's base period by an amendment to Order M-54.

Burlap Bags—New burlap bags may now be used as covers for small refined sugar bags such as shelf packages as a result of amendments to Conservation Order M-221. The amended order also stipulates that the West Coast wheat bag may be used for packing small grains in certain western states. Farmers in those states may buy 100 percent of the bags bought in the base period 1940 for small grain crops.

WFA Orders

Frozen Chicken—Removal or sale of frozen chicken in storage before 12:01 A. M., E.W.T., December 30 has been prohibited. This action does not apply to chickens and fowl stored after the designated time and will remain in effect until about 70 million pounds has been obtained. The action is embodied in FDO 91.

Meat—Civilian supply of meat in 1944 will be 67 percent of the total supplies available. This allocation will permit about the same per capita consumption of meat in 1944 as in 1943.

Fruit Spreads—Approximately 416 million pounds of jams, jellies, marmalade and apple butter will have passed into the hands of civilian consumers during the pack year ending June 30, according to the allocations announced January 10. This is about 69 percent of the total supply of 600 million pounds. The U. S. armed forces are assigned 27 percent, with only 3 percent going to the United Nations and other claimants.

Canned Peaches—The Quartermaster General was authorized to release 5 percent or about 750 thousand cases of canned peaches for civilian supply on December 28. These were supplies that were owned and held by the canners, but set aside for government purchase. The action was in line with the policy of making available to civilians all possible supplies of food not actually needed for direct war use.

Milk—To permit milk dealers maximum flexibility in using their milk supplies under milk conservation order FDO 79, the market agents have been authorized to establish sales quotas for milk, cream and milk byproducts on the basis of milk solids

instead of volume and butterfat. This delegation of authority, granted by amendment 1 to FDO 79.102, also stipulates that solids represented in milk byproducts and cream quotas may be transferred to fluid milk on a pound-for-pound basis. The amendment does not affect the total consumer supplies of milk used in fluid milk, cream and milk byproducts.

Tea—If limitations on shipping space permit, U. S. civilians will receive 76 million of the 90 million pounds of tea available in 1944, according to the allocations announced by WFA on December 31. Because of the constantly changing wartime conditions, deliveries cannot be determined too far in advance. Thus, definite allocations are usually made for only three months at a time.

Hog Prices—The adjustments in hog support prices, which were in effect in numerous markets during December, were continued until further notice by amendment 9 to FDO 75, effective January 1. The amendment also provides further adjustments in five markets and sets the support price at $1 per hundredweight below the maximum price in effect on Nov. 29, 1943, at any given market other than those at which adjustments of the support level have been announced.

Oil of Peppermint—As a result of more favorable inventories, quotas on the use of oil of peppermint were increased by amendment 1 to FDO 81, retroactive to Nov. 1, 1943. Manufacturers of confectionery and chewing gum may now use 70 percent of the amount they used in any corresponding period in 1941. The amendment also requires users of more than 40 lb. in any one of the past three years to report to the director and provides exemptions from the quota in designated cases.

Oilseed—Processors were ordered to set aside 20 percent of their February production of oilseed meal for directed distribution to areas designated by WFA. The set-aside order, issued under FPO 9, is the second to be issued and pertains to cottonseed, soybean, linseed and peanut oil meal, cake or pellets.

Fish Oils—Appeals for exemption of fish oils having a high free fatty acid content from restrictions of FDO 60 will be considered if filed with the Chief, Fats and Oils Branch, Food Distribution Administration, Washington 25, D. C.

Coffee and Cocoa—More coffee, cocoa and chocolate are alloted to civilians by the 1944 allocations announced by WFA. Per capita consumption of roasted coffee is expected to be about 13.7 lb., while the products of cocoa beans received by civilians will be about 4 lb. each. This is an increase of about 4 lb. of coffee and ½ lb. of cocoa beans per person over 1943.

These civilian allocations represent about 80 percent of the total of two billion pounds for coffee and approximately 72 percent of a total of 705 million pounds of cocoa beans. Exact figures on chocolate and cocoa products are not computable.

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CAPITAL VIEWS

FUEL ECONOMY—Every kind of fuel is scarce. Interior Department officials responsible for the war fuel supply know this. They have organized a corps of competent engineers who volunteer to aid any fuel user on request. Local plant executives who think that they might be assisted by such advisors can ask for help or suggestions. The whole matter is in charge of National Fuel Efficiency Council, U. S. Bureau of Mines, Washington, D. C.

STORAGE IS SCARCE—Storage space is scarce, especially space for cold storage or frozen food storage. Much of the difficulty comes from the piling up of unusual stocks held in reserve by the government for war usage. Much of this is necessary. Some of it represents overbuying or hoarding. But industry can do little about the matter of cutting down on needless reserves, since questions of that sort are settled in Washington. It is important, however, that industrial executives using cold storage for raw materials or processed goods should schedule their own business to use the minimum space possible. In some cases goods are being ordered out of storage altogether. In other cases a speed-up of use from storage is demanded by Uncle Sam. For example, preservers of fruit have been requested to use up their stored stocks of frozen fruit as promptly as possible, even where this represents a speed-up of factory operations today with a prospect of shutdown later. No management interested in storage at any stage can afford to ignore these difficulties.

AID FOR MARCH 15—Bureau of Internal Revenue officials will provide advisors to assist factory personnel in understanding their March 15 tax report. In some cases a representative of the Bureau can be stationed at the factory to cut down the time required by workers in seeking aid. If this will cut absenteeism and speed war production, the Bureau will do its best to help, even though the number of expert advisors is not enough to serve everyone as much as may be wished.

NO FOOD "CUT-BACK"—One of the principal jobs of the Washington observer is to figure out where the next cut-back in production will occur. Obviously, as we approach the end of European fighting, we need fewer tanks and less of the other equipment for heavy land battles. Such changes reach clear back to questions of raw material supply. Some of the statements on this subject by important officials are contradicted by others, such as the controversy over how much less aluminum we will need later this year. But the food industries can be certain that there will be no cut-back in demand for any major class of food.

Only slightly less certain is the prospect that mere "luxury" foods will not get much help in the way of priorities until after the emergency feeding of released populations has gone a lot farther. One of the ways in which Washington plans to exercise control on these questions is by restriction of containers and wrapping materials. Obviously, we can't manufacture usefully or profitably the things for which we can't get cans, bottles, boxes or cartons. If any division of food business is in doubt regarding its prospects for the rest of 1944, it can make a most useful guess by finding out how much container material it will be promised at the offices of WPB and WFA.

NEEDLESS SPOILAGE—ODT was not playing politics when it told other government agencies that they were hoarding too much food in the warehouses of America. Some of the impressions regarding what ODT said are not quite correct. But they do appear to be making a splendid case for the release of much food for civilian use since they are demonstrating the existence of excessive stocks. It will probably not be necessary for them to demonstrate imminent danger of spoilage in storage in order to get these goods moving again, especially in an election year!

"A COST-OF-FOOD" LAW—The President's message to Congress on its resumption of business January 11 reemphasized the desire of Federal authorities for intimate regulations of every phase of the food business. It was one of the frankest state-

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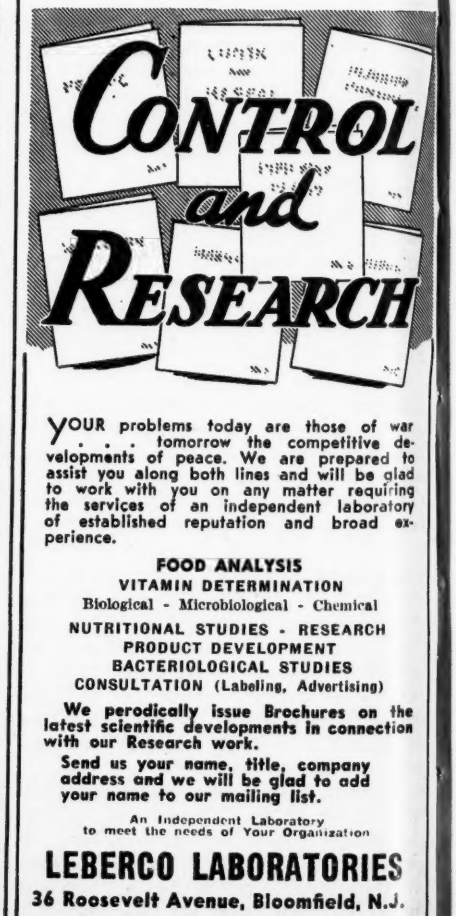
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ments of the intention to push up the floor under raw material prices while holding down the ceiling over wholesale and retail prices. The squeeze on processors does not worry those who would so regulate the food business.

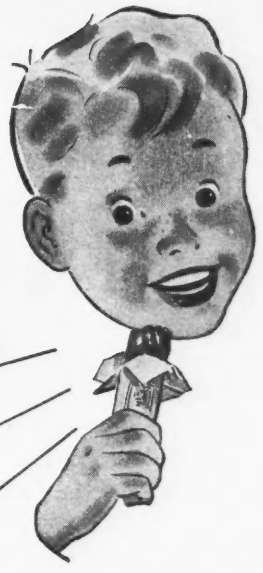
It is going to be very important for members of Congress to know from food manufacturers the exact facts as to the consequence of two such price policies. A markup less than the cost of doing business can often be demonstrated. Facts as to the effect of such proposals should be made clear to the legislators before they have to set a pattern on food prices for the rest of the war period. Without going contrary to the national well-being, Congressmen can be encouraged to be a bit realistic in these matters, lest the food processing industries be made bankrupt in very unreasonable and unnecessary numbers.

HUNGRY UNIFORMS—Meat allocation by the War Food Administration during 1944 provides 67 percent of the total for civilians and 17 percent for military consumption. Simple arithmetic indicates that the military will eat three times as much meat per person as the civilians, under this plan. For good public relations it would appear wise that the Army and Navy do not let Mrs. Housewife know about this disparity when she goes to the butcher shop.

TO CUT SPOILAGE—Wholesalers and retailers are expected to cut down both prices and point values of rationed foods that might spoil if held in stock too long. There are standard rules to guide this practice, fixed by OPA nationally. Manufacturers whose goods may need this speed-up in distribution can well study this problem for their distributors. Advice on this matter may save both the food and the time of distributors. Most important is to be sure that the distributor knows that he must cut the price, generally by at least 25 percent, if he wishes to cut the point value of rationed goods. If he ignores the price cutting, he may find himself in serious difficulty with OPA.

SELLING NEW PRODUCTS—Food manufacturers interested in developing new products such as dehydrated foods can profitably study the following statement which came from one of the constructive units of government: "It seldom occurs to the apostles of dehydration—or of any new food, for that matter—to search for recipes and cookery that make better grub of the new product than can be made of the old. People distrust imitations. A new food should stand or fall on its own merits as a food—not on its similarity to other foods."

FISH GOALS—Production goals for the fishing industry have been set at four billion pounds for 1944. The main difficulty in reaching this goal is expected to be a shortage of personnel. Last year the difficulty was shortage of vessels but that may be corrected, the Coordinator of Fisheries says. There is no indication that the fish have been told regarding their part in the war effort.



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Ethavan, vanilla-like in taste, imparts a flavor that your customers will say is "super"! Products with Ethavan have a pleasing aroma, and, with its flavoring strength approximately three times that of vanillin, Ethavan is economical to use.

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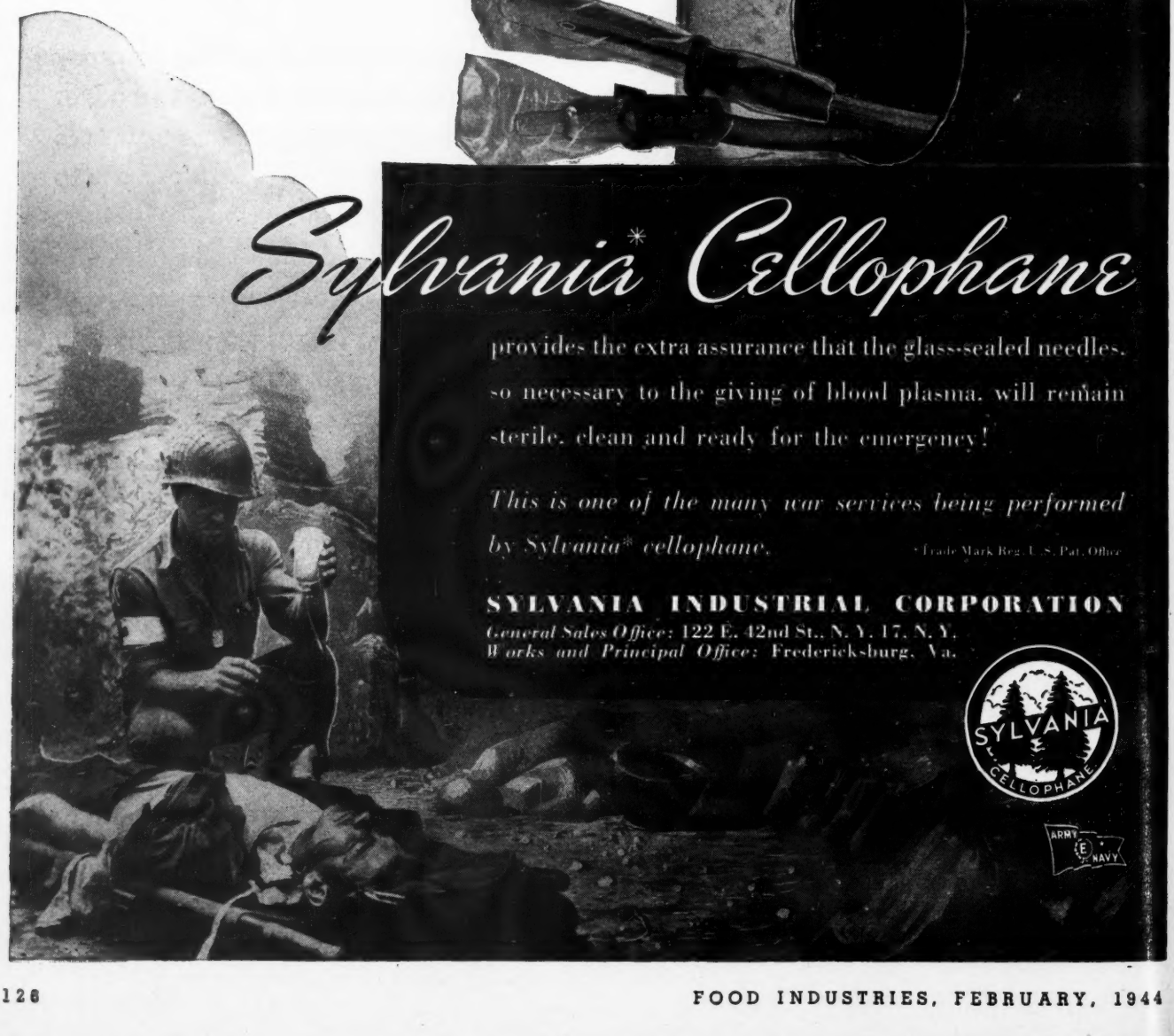

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INDUSTRY

Agash Refining Corp., Brooklyn, N. Y., vegetable oil refinery, whose change of ownership and management had been effected late in 1942, is now known as Italian Cook Oil Corp.

Armour & Co. has purchased ten plants located in Minnesota and North and South Dakota belonging to DeSota Creamery & Produce Co., Minneapolis, Minn., with no change in management or operating personnel. The ten plants are valued at $2,500,000, including both inventories of raw and finished materials. Nine of the plants handle poultry and eggs while the tenth is a creamery and makes ice cream.

Borden Co., New York, has completed negotiations to acquire Vonk's Dairy, of Grand Rapids, Mich. and Zachman's Dairy, Marion, Ohio. Vonk's Dairy will become a part of Borden's Dairy & Ice Cream Co. in Grand Rapids, and Zachman's will be absorbed by Moores & Ross, the Borden branch in Marion.

California Conserving Co.'s cannery at Oakdale, Calif., has been destroyed by fire. Total loss estimated at $500,000, included 2,000,000 gal. cans of government owned peaches and vegetables.

Central Soya Co., Inc., Fort Wayne, Ind., has organized an agronomy department for agricultural research and experimentation headed by J. W. Calland, vice-president and a director of Central Sugar Co., an affiliated company.

Confections, Inc., Chicago, has bought Oliver Bricker Co., a popcorn plant situated in Red Oak, Iowa.

Curtiss Candy Co., Chicago, is cooperating with WPB's tin can salvage program by distributing counter cards, window stickers and pamphlets to dealers in the 13 middle western states which they serve.

Grand Valley Brewing Co., Ionia, Mich., has purchased C. Kern Brewing Co., Port Huron, Mich. The company will operate as a subsidiary.

Houston Milling Co., Houston, Tex., has been awarded the Army-Navy "E" for its high production of stock and poultry feeds. Hershey Chocolate Corp., Hershey, Pa., has been presented an additional white star which will be added to its "E" pennant.

Kraft Cheese Co. has taken over the plant and equipment of National Egg Drying Corp., Melrose, Minn., and plans to convert the plant into a diversified milk drying and dairy product operation.

HECTOR LAZO

Formerly assistant director of Board of Economic Warfare and administrator of export control, Hector Lazo reenters the food field as a member of the executive staff of Loose-Wiles Biscuit Co., Long Island City, N. Y. Mr. Lazo will make the New York office his official headquarters, but will assist Hanford Main, president of the organization, in Washington, D. C.

Michigan Sugar Co.'s beet pulp warehouse at Caro, Mich., was destroyed by fire with damage estimated at $250,000. The building contained at the time approximately 1,500 tons of pulp, a dried by-product of the sugar extracting process which is used for stock feed.

AKSEL G. OLSEN

Aksel G. Olsen has been named manager of General Foods Corp.'s Central Laboratories in Hoboken, N. J. Dr. Olsen joined the company in 1923 as research chemist at its Battle Creek laboratories. He was appointed director of research for Walter Baker & Co., Inc., a subsidiary, in 1934, and has been connected with Central Laboratories in various executive capacities since 1938.

LAWRENCE G. BUTLER

Lakeshire-Marty Co., Plymouth, Wis., a division of Borden Co., New York, has promoted Lawrence G. Butler, formerly executive vice-president of the division, to the office of president, succeeding C. A. Eckburg, who left that position to become a vice-president of Borden. Vilas R. Butler, assistant to Mr. Butler, has been named vice-president.

Miller Bros. Food Co., San Carlos, Tex., has extended its quick freezing operations to include the processing of green beans and both pink and white grapefruit sections.

Ozark Co-operative Dairy Goat Producers Association plans to construct a cheese factory in Harrison, Ark.

Pepsi-Cola Co. has purchased Central Espana sugar mill in Matanzas Province, Cuba. The property consists of a plantation, mill and refinery, as well as 77,000 acres of sugar land.

Schulze & Burch Biscuit Co., Chicago, has sold its old biscuit plant and will handle all production in its new plant in the central manufacturing district.

J. R. Simplot, Caldwell, Idaho, manufacturer of dehydrated foods, plans to construct a $1,000,000 phosphate fertilizer manufacturing plant north of Pocatello, Idaho, to help improve intermountain farm production. Simplot has also received the Army-Navy "E" award.

Standard Brands, Inc., New York, has acquired Shefford Cheese Co., Inc., Green Bay, Wis., a subsidiary of Kingan & Co., Inc. The Shefford company processes, packages and distributes cheese and cheese spreads.

Washington Co-Operative Egg & Poultry Association, Seattle, Wash., has bought Mankato Soy Bean Products Co., Mankato, Minn.

Bronze Bearing

A BIT of bronze in your product — that's all — but it can break a tooth! "Stoning" — removing such dangerous saboteurs from your product as that bit of bronze — has been streamlined. To eliminate this great headache of the cereal, soy-bean, and other dry food processors, we have developed a new type stoner — revolutionary in design, amazing in efficiency, low in first cost, in operation. Removes stones, glass, non-magnetic metals, and all other hard, dangerous contaminations from cereals, soy-beans and other beans, and other food products, with, 1) an action so sensitive the tiniest particles are easily removed; and 2) operating cost so low it is relatively insignificant; and 3) 99.9% efficiency. Capacity up to 16 tons per hour. Write for Bulletin FI-244.

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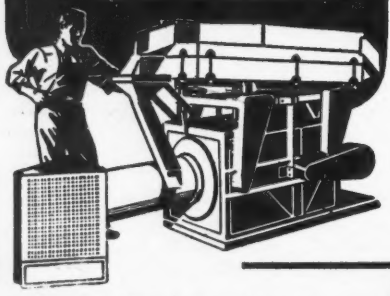

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PERSONNEL

R. H. Armenta, formerly in charge of WPB's Dehydrated Foods Section, is now manager of Kern County Dehydration Co., Bakersfield, Calif., succeeding E. H. Rawl.

J. J. Babb, general manager of Booth Fisheries Corp., Chicago, Ill., has been appointed a vice-president of the company.

Basil E. Bailey has become research manager of the laboratories of Canadian Fishing Co., Ltd., Vancouver, B. C., Canada. Previous to his appointment he had been biochemist on the staff of Pacific Fisheries Experimental Station at Vancouver.

John L. Baxter, of H. C. Baxter & Bro., Brunswick, Me., and J. H. Page, of Maine Dehydration Co., have been elected president and vice-president, respectively, of the newly formed Association of Maine Dehydrators. J. T. Wight, Maine Food Processors, becomes secretary and treasurer.

W. J. Burnap, vice-president and director of Rieck McJunkin Dairy Co., Pittsburgh, Pa., has retired after 44 years of service with the company.

John L. Crowley has returned as manager of the Wilson & Co. plant at Albert Lea, Minn., after a leave of absence of 11 months during which he had been head of the industry section of the meat branch of Food Rationing Division of OPA.

John H. Karrh, formerly of Victor Chemical Co., has become plant manager of a butadiene plant to be constructed at Eddington, Pa.

Robert R. Lacey, former president of Binghamton Candy Co., Binghamton, N. Y., and more recently connected with OPA, has been named production analyst on postwar plans for Loft Candy Corp., Long Island City, N. Y.

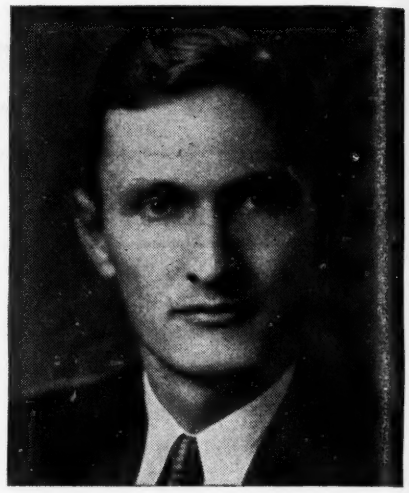
H. D. Landes of Salt Lake City, Utah, has been elected president of Pleasant Grove Canning Co., Pleasant Grove, Utah. William Chipman has been appointed to the vice-presidency.

Louis J. Lataillade, formerly director of research of U. S. Products Corp., San Jose, Calif., has become products control manager for Tea Garden Products Co., San Francisco.

J. F. Novak, formerly secretary of Sokol & Co., Chicago, Ill., has been elected president of the company, succeeding the late John A. Sokol.

Eurico Penteado, delegate of Brazil, has been reelected chairman of Pan-American Coffee Bureau for the coming year.

Roy B. Rogers, formerly with DeGraff (Ohio) Food Co., has purchased the Pemberville, Ohio, canning plant of W. L. Jones Food Co. The plant will operate under the name of Pemberville Canning Co. for canning tomatoes and tomato products.



E. B. OBERG

Formerly head of research of Central Soya Co.'s research laboratory, E. B. Oberg has been elected director of Carnation Co.'s recently expanded research laboratory at Milwauke, Wis. For two years, Dr. Oberg worked in the Soya Products Division of Glidden Co., Chicago, and from there he went to Central Soya as director of its research laboratory. He is a member of American Chemical Society, American Soybean Association and American Oil Chemists Society.

Thomas A. Rohrabough is the newly appointed plant manager of the Redwood City, Calif., plant of S. & W. Fine Foods, succeeding Charles Lachman, who will continue as S. & W.'s food processing research consultant. Mr. Rohrabough was formerly plant manager for H. J. Heinz Co.'s Oakland, Calif., branch.

Helge Shipstead has been named director of research of Borden Co.'s dry milk division, with headquarters in Syracuse, N. Y.

Arthur C. Sullivan has been elected president, and Frank M. Archer, vice-president and general manager, of Moxie Co., Boston, Mass.

Norman W. Stewart, president of E. Pritchard, Inc., Bridgeton, N. J., has been appointed president of Tri-States Packers Association at its recent Philadelphia meeting.

Walter Trego, formerly treasurer of Hoopeston Canning Co., Hoopeston, Ill., has been elected president of the company, succeeding the late Edward F. Trego.

G. C. Wallis has been appointed assistant technical director of the Special Products Department of Standard Brands, Inc., New York.

E. J. White, who has recently resigned his position as president of Honor Brand Frosted Foods Corp., a subsidiary of Stokely Bros. & Co., has entered the frosted foods brokerage business under the name of E. J. White Co., San Francisco.

DEATHS

Harry C. Carr, 70, former executive vice-president and a director of Libby, McNeill & Libby until he retired in 1939, December 28, in Chicago. Mr. Carr had served the food industry for 46 years.

Frank A. Dixon, 77, director of experimental horticulture research for Canners League of California and who had been a member of the canning industry of California for over 60 years, recently, in San Jose, Calif.

Milton J. Heim, 49, manager of the Central Division of National Starch Products, Inc., New York, recently, in Germantown, Philadelphia.

C. H. Musselman, 63, formerly one of the founders and president of Pennsylvania Canners Association for several terms, and a leading canner of apple products, January 6, in Biglerville, Pa.

John A. Sokol, 68, founder and president of Sokol & Co., Chicago importers and exporters of food specialties, December 22, in Chicago. He had been an important figure in the dehydration field acting as sales agent for a number of vegetable dehydrators and also a manufacturer of dehydrated soup mixes.

ASSOCIATED INDUSTRIES

American Can Co., New York, has promoted M. J. Sullivan, president, to chairman of the board and D. W. Figgis, executive vice-president, to the office of president, succeeded by C. H. Black.

Food Machinery Corp., Sprague-Sells Division, Hoopeston, Ill., has purchased Westminster Machine Works, Westminster, Md., and will continue to manufacture the "Kyler" line of labeling and boxing machines.

Owens-Illinois Can Co., Baltimore, Md., plant; the Keene and Winchester, N. H., branches and mill D in Concord and mill X in West Swanzey, N. H., of New England Box Co.; and Pflaudler Co., Rochester, N. Y., have been presented the Army-Navy "E" award for high production achievement. H. K. Porter Co., Inc., Everett, Mass., and Sarco Co., Inc., have been awarded an extra star for their "E" pennants for continued excellence in production.

St. Regis Paper Co., New York, has purchased all logging operations of West Fork Timber Co., Lewis County, Wash., and acquired the cutting rights to the 109,000 acres of timber land owned and controlled by that company. This step will make certain the continued manufacture of multiwall bags for vital war and civilian requirements.

DIVERSOL

. . . THE "BAZOOKA" BACTERICIDE

Like the famous armor shattering "bazooka," Diversol has the unique ability to penetrate organic film . . . *and with equally effective results!*

Food-spoiling bacteria often lurk beneath the invisible film of grease that frequently remains on equipment after cleaning . . . thus escaping ordinary bactericides that can't get to them. A dependable, "100% sure" bactericide must have penetrating power . . . like Diversol it must be able to pierce grease and make contact with otherwise elusive bacteria.

Yet despite bazooka-like power to penetrate the invisible film, Diversol is harmless to food processing equipment . . . will not corrode or otherwise damage it. Comes in stable crystals that seal-in the quick-acting, available chlorine until dissolved in water. With Diversol it is a simple matter to prepare solutions of a definite, germicidal strength. Just add the required amount of water . . . then rinse or spray the previously cleaned equipment.

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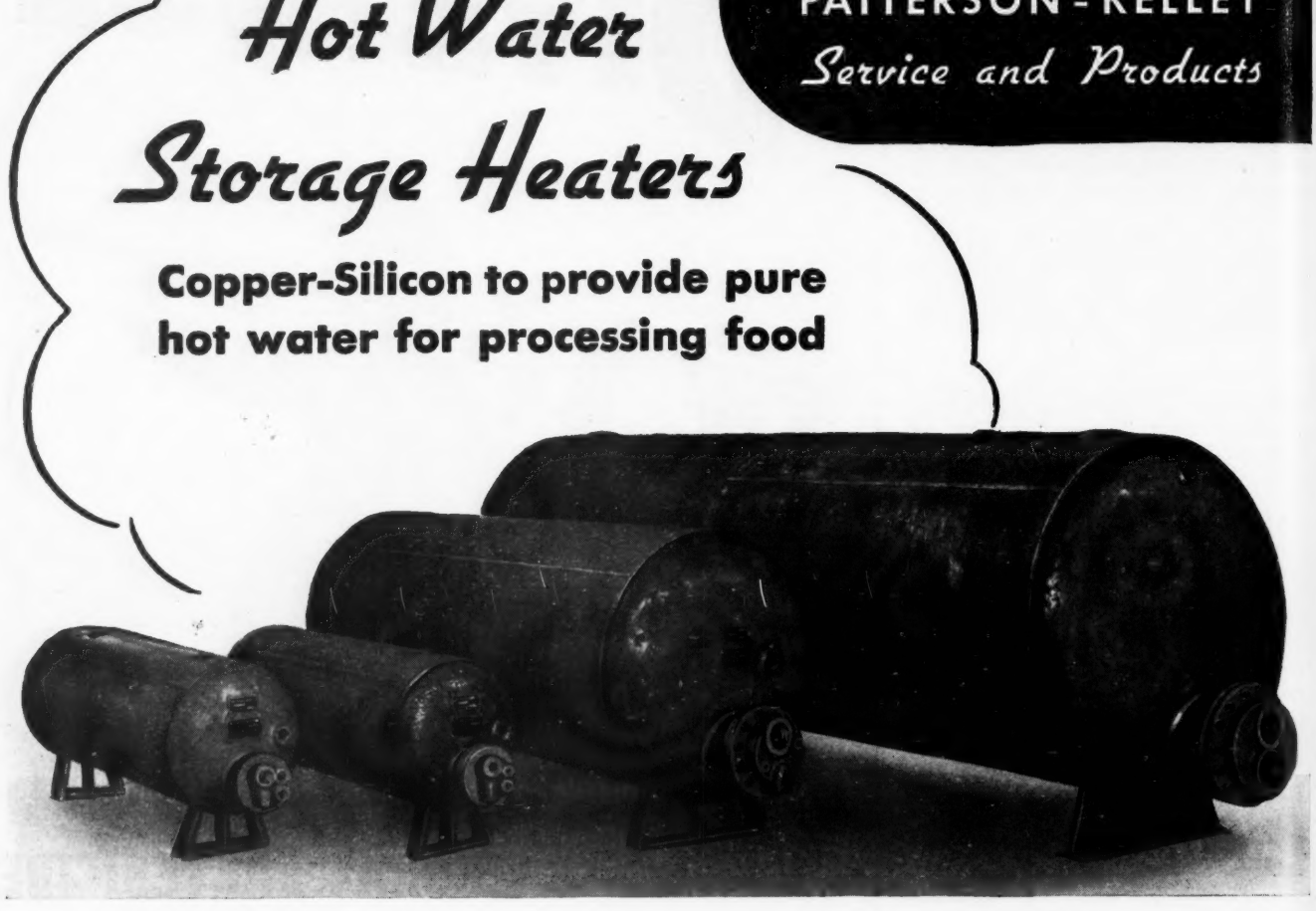
Copper-Silicon to provide pure hot water for processing food



Our engineers know full well the danger of contamination in the processing of foods. They know how to make use of all the approved non-corroding metals for Hot Water Heaters, Kettles, Cookers, and Mixers, Dehydraters, Dryers, etc. Our shopmen know how to fabricate with all metals. They know how to finish off surfaces to provide maximum washing and sterilizing efficiency.

Many a Patterson-Kelley unit — stainless steel, stainless-clad, copper or copper-lined — has left our shops heading for some food-processing plant. If standard units will not fit your requirements, our engineers will be glad to design them, bringing to the problems more than 60 years' experience in such work.

★ ★ ★

Patterson-Kelley Hot Water Storage Heaters are constructed of steel, stainless steel, stainless-clad steel, copper, copper-lined steel, copper-silicon alloy and nickel-clad.

EST. 1890

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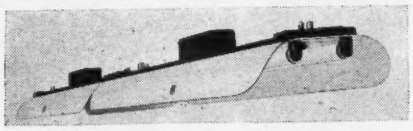
1-PK-1

FOOD EQUIPMENT NEWS

Industrial Luminaire

WESTINGHOUSE ELECTRIC & MFG. Co., East Pittsburgh, Pa., has announced a light-weight fluorescent Luminaire with one-piece, double-length hood and two full size reflectors, designed for easy continuous strip installation in industrial plants. Available for use with four or six 40-watt, or four 100-watt Mazda F lamps, this new Type FNC Luminaire is said to be the equivalent of two conventional units.

The hood is fabricated from sheet steel with all ballasts, lamp holders and starter sockets mounted and wired as part of the channel assembly. Sliding hangers permit suspension from any part of the hood. Mounting arrangements are available for any application. The moisture-resistant, non-metallic reflectors are covered with a multi-coat polymerized finish that provides a reflection factor of 85 percent or more, and are installed for easy removal for cleaning.



Double reflector continuous strip Luminaire for industrial lighting.

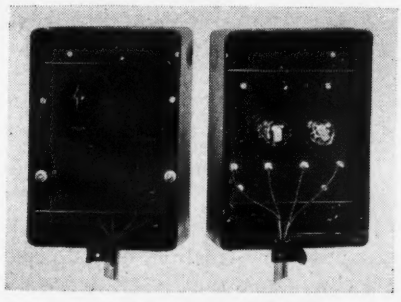
Glass Standards for Fluorometers

BAUSCH & LOMB OPTICAL Co., Rochester, N. Y., through its Scientific Bureau, has proposed the substitution of fluorescent glass standards to replace chemical solutions for the calibration of fluorometric instruments. This bureau has studied and selected several types of glass that supply reliable reproducible values. Particular types of glass have been developed suitable for standards in the fluorometric determination of vitamin B_1 and vitamin B_2. Made in the form of blocks, these standards will replace the liquid filter holders normally used for standard solutions.

Once a glass standard has been properly set up and calibrated by accurately known solutions and under prescribed working conditions, it is stated that it will serve as a permanent secondary working standard against which a particular instrument may be quickly and easily checked.

Bin Level Indicator

MOSHER ELECTRONIC CONTROL SYSTEMS, 130 West 42nd St., New York 18, is making a dry materials bin level indicator operating on electronic principles and having no moving parts. This device consists of two parts, as shown in the accompanying illustration. The first is a detector box, containing a series of vacuum tubes and attached to a probe extending downward into the bin. The second box is the signal control, upon which are mounted colored lights to show when bin is full, empty or other indications as desired. Hook-up with valve cut-offs, audible alarms or remote signal devices can be arranged through relays.



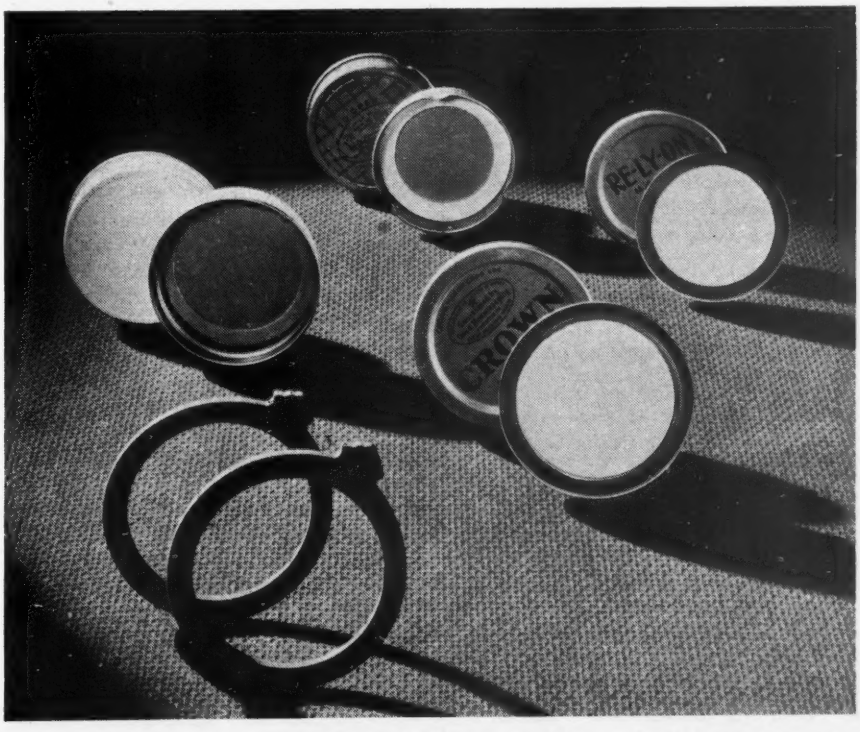
Bin level indicator, with control box at right and detector box at left, showing boxes with covers removed.

Synthetic Rubber Sponge

B. F. GOODRICH Co., Akron, Ohio, is now manufacturing a general purpose synthetic rubber sponge. This product is made in three densities, soft, medium and firm grades. And each of these grades is said to have good oil resisting properties and can be made into slabs, cord, tubing or in almost any other molded shape. The grades correspond fairly well with prewar crude rubber sponge grades. Slabs of 24x120 in. are available in thicknesses of $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in. Also 24x60 in. slabs are available in $\frac{3}{4}$ and 1 in. thicknesses.

Food Compression Press

FOR debulking dehydrated foods, chemicals and other materials, F. J. Stokes Machine Co., Tabor Road, Olney P.O., Philadelphia, has brought out an improved design of its Model R automatic press. This machine will compress pieces up to 3 in. in diameter with a die-fill of $2\frac{3}{8}$ in., at rates of 15 to 45 per minute. Pressures up to 20 tons are applied from both top and bottom, and pressure adjustments may be made while the press is in operation. This permits control of the density of the product with great exactness.



Crown Cork & Seal Co., Inc., Baltimore, Md., is now making all the sealing compounds used in Crown closures from Government Reserve synthetic rubber and now employs no natural rubber whatever for this purpose.

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A continuous flow of uniformly-finished potato chips is assured with

FERRY CONTINUOUS POTATO-CHIP MACHINES

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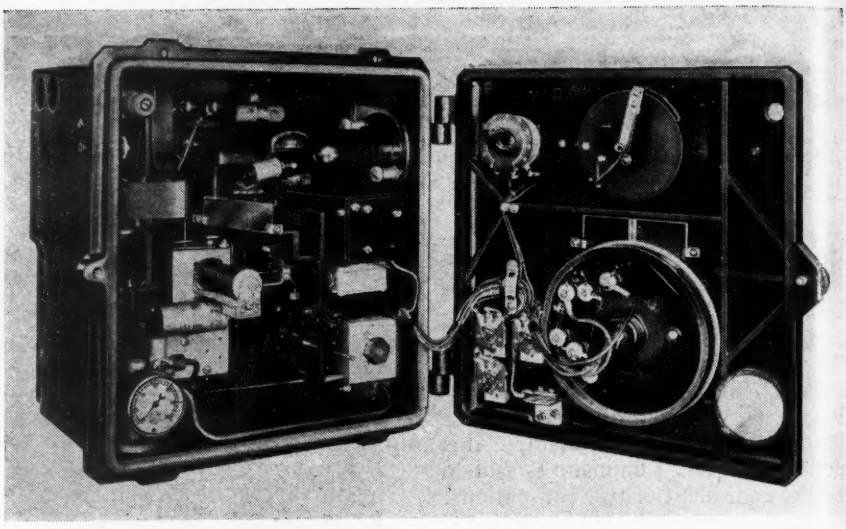


Interior of electronic-pneumatic indicating controller.

Features of the new press include extra heavy construction, separate ejection and compressing levers, screw adjustments for compression, independent ejection cam, twin disk clutch and combined brake that instantly starts and stops the machine even under full compression load, variable speed drive to attain maximum production with materials of varying characteristics and size, and adjustable gibs to maintain close accuracy in punch and die alignment.

Electronic-Pneumatic Controller

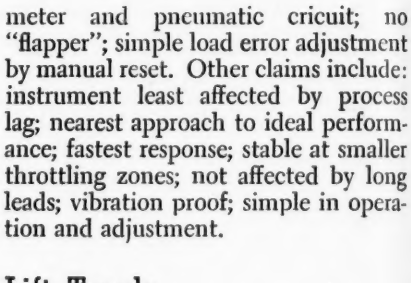
C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y., has developed a "Celectray" pneumatic indicating controller that employs no motor or other continuously moving parts. In this instrument, the original "Celectray" controller, with its mirror galvanometer and photoelectric amplifier is combined with a pneumatic follow-up. The output air is precisely and stably controlled to provide the best performance, according to the inherent possibilities lying in ordinary throttling control with manual reset, or with automatic reset. On-and-off, or open-and-shut control is available in two models; high-sensitivity, non-adjustable throttling; or on-and-off without throttling.

This new instrument differs from the standard model of "Celectray" controller in that a magnetic air valve has been substituted for the relay. This valve acts as an amplifier and converter from electric to pneumatic operation.

Among the advantages claimed for this controller are: no motor; continuous action; no measurable "dead zone"; highest sensitivity and adjustment to very low sensitivity; no mechanical connection between galvanometer and pneumatic cricuit; no "flapper"; simple load error adjustment by manual reset. Other claims include: instrument least affected by process lag; nearest approach to ideal performance; fastest response; stable at smaller throttling zones; not affected by long leads; vibration proof; simple in operation and adjustment.

Lift Truck

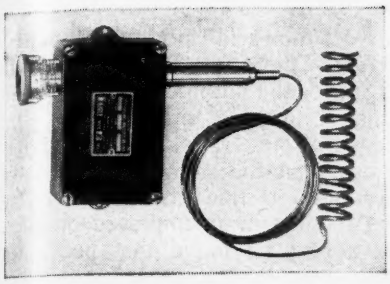
Baker Industrial Truck Division, Baker-Raulang Co., 2168 W. 25th St., Cleveland 13, Ohio, recently announced the Type E-3 low lift industrial truck. This truck is designed for a capacity of 6,000-lb. load, steers on all four wheels, and is operated by a horizontal tiller handle. It is designed for operation in intersecting aisles 67 in. wide. The overall length is 123¾ in., the width is 42¾ in., and the height is 55 in. The platform is 26½x54 in., is 11 in. high in the low position and has a vertical lift of 6 in.



Low lift industrial electric truck having a capacity of 6,000-lb. load.

Thermostat

United Electric Control Co., 69 A Street, Boston, Mass., has brought out a sensitive, wide range, accurately calibrated thermostat for air, liquid and hot plate applications. This thermostat is made in two ranges: — 100 to



Thermostat for air, liquids and hot plate applications.

+ 100 deg. F., and 50 to 600 deg. F. The entire thermal assembly, including bulb, capillary connecting tube and bellows, is solidly liquid filled and has a uniform expansion per degree change in temperature. This is said to enable the use of micrometer adjustment and give the advantage of wide range calibration. The micrometer type adjustment is calibrated for both Fahrenheit and Centigrade, and calibration accuracy as close as 2 percent is claimed.

The makers state that extremely close control is obtained with this thermostat because practically all lost motion is eliminated. The thermostat is said to give control within a total differential of 1 deg. F. in mechanical convection type ovens and 0.2 deg. F. in liquid baths. Another advantage claimed is ambient compensation, with ambient drift of less than 0.2 deg. F. in 5 deg. F. of ambient change.

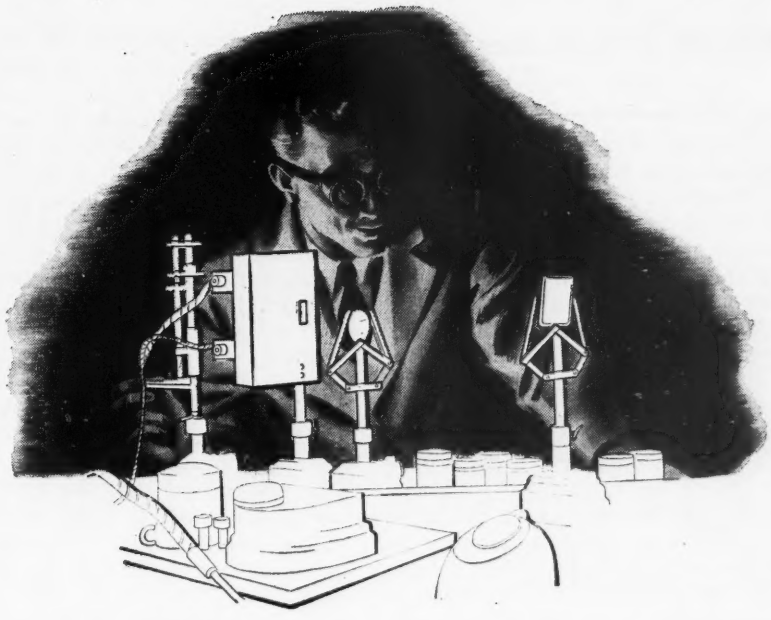
This thermostat is made in three models: Oven control thermostat; liquid temperature control model; and indicating controller model for ranges.

Vitamin A Tester

La Motte Chemical Products Co., Towson, Baltimore, Md., has announced a simplified testing outfit for determining vitamin A content. This provides a chemical procedure based on the method of Dr. B. L. Oser of Food Research Laboratories, 48-14 33rd St., Long Island City, N. Y. The set comes complete in a carrying case with color standards, comparator, standardized reagents and full instructions.

Absorbent Floor Cleaner

Bonwit-International Co., 10 West 33rd St., New York, is marketing a floor cleaner and oil and grease absorbent known as "Bonco No. 1". This cleaner is listed by the Underwriters Laboratories as a Class 1 non-combustible absorbent for reducing fire and slipping hazards, and for floor cleaning. It is said to be non-abrasive; odorless; non-toxic; non-injurious to skin, clothing, or floors; and to absorb up to 45–50 percent of oil or grease by weight.



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The economy of using Hackney barrels and drums starts back in the laboratory and progresses with every step in Pressed Steel Tank Company's production. For here, metallurgists combine up-to-the-minute research with the knowledge gained in more than 40 years of volume production.

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Cabinet Dehydraters

(*Continued from page 92*)

the contents of the trays are dumped together in the bin, the top closed with the exception of an outlet vent, and air heated to 120 to 125 deg. F. is blown up through the material.

Some suitable means of judging the endpoint must be used to make sure that the finished product is uniformly dry and of low enough moisture content to package safely. The often-used method of "feel and guess" is far from satisfactory, since even fairly wide variations in moisture content cannot be judged accurately. It is usually stated that if leafy products can be crumbled to a fine powder, and the solid or root products can be broken with a snap, they are sufficiently dry to be packaged. The only way to make sure is to make a moisture determination on the finished product by either the toluene distillation or the oven method. The finished products should be packaged in a moisture-proof, vapor-proof, and insect-proof container, preferably under a gas such as carbon dioxide or nitrogen. The containers should be labeled with their contents and date of packaging, and stored at as cool a temperature as possible.

Part III concluding this article will be published in March.—THE EDITORS.

Improves Frozen Fruits

(*Continued from page 102*)

juice. Probably the pH value of the fruit was unfavorable for pectase action.

Low-Sugar Jellied Products from Frozen Fruits

With these low-ester pectinates, which form gels at any desired sugar concentration, it should be possible to form jellied products directly from the frozen fruit. Consequently, after the drained weight determinations had been made, in some of the samples the drained juice was recombined with the fruit, heated to boiling, and then poured into jars and allowed to cool. Spreads of the desired consistency were obtained.

Because of the short heating period necessary to obtain the desired consistency, there was less loss of the aromatic constituents from the fruit, and the products had a full-fruit flavor not ordinarily found in these products. Also because of the lower sugar requirements necessary to form a gel, the excessive sweetness found in a 65-percent sugar product did not mask the fruit flavor.

The product obtained with the red, sour cherries was a gel containing the whole fruit, which would be excellent for dessert purposes. The product had the fine, full flavor of fresh cherries, and the texture of the fruit was similar to that of fresh cherries. The product containing 20 percent added sugar had about the right sweetness for dessert purposes. A concentration of pectinate of about 1 percent was necessary to give a satisfactory gel for this purpose.

Jellied products, both clear and pulpy, were prepared from the frozen raspberries containing the added pectinate. Further sugar was added to these preparations to give a total sugar content of 35 percent. The products had the natural fruit flavor because it was not necessary to boil them for an excessively long time to get the desired consistency. Again a concentration of 1 percent pectinate was necessary to produce the desired consistency. Too high a concentration of pectinate yields a product which has a "pasty" or "grainy" texture.

The preliminary results discussed above indicate that the gel power of the pectinate used is an important factor in preparing jellied products from the frozen fruit. A lower concentration of a pectinate with a high gel power may be used to obtain the desired consistency.

Of the three methods—alkali, acid and enzyme—proposed for producing pectinates, the last two have been under investigation in the Eastern Regional Research Laboratory. Early in the investigation it became evident that the properties of the pectinates produced by the two methods did not depend entirely on the amount of residual methyl ester but that other effects on the pectin molecule were involved. In studying methods of preparing these substances it was obvious that various criteria must be applied for their evaluation, among them being methyl ester content, viscosity, optimal calcium concentration for gel formation of pH to gel formation, molecular weight and application to a particular use. The use of pectinates in the freezing of fruits to reduce the amount of drained juice on thawing was suggested by Baker.

Interest in low-ester pectinates is increasing, as evidenced by the number of patents and other publications which have appeared in recent years (3,4,5,6,7). As the properties of low-ester pectins become better known, new uses will be found for which they are particularly adapted. Very little work has been reported on the use of pectic substances in the freezing preservation of fruits. Cowgill (3) was granted a patent in 1938 on the use of a "non-acid pectin" dispersed through the fruit, with or without sugar, for the purpose of reducing the amount of juice formed during the period of preservation. Baker (2) has shown that the addition of low-ester pectinates to strawberries before freezing resulted in an improved product. As a rule, he found that pectinates with a low-ester content gave better results than those with a high-ester content. With one variety of peaches (Elberta), however, the reverse was true. Tressler (8) has suggested the use of commercial pectin in the preparation of frozen-fruit purees for the manufacture of marble-type ice cream. Low-ester pectinates would seem to be suitable for this use, as gels could be formed of the same sugar content as the ice cream.

Conclusions and Summary

Most of the pectinate samples used were effective in reducing the amount of juice draining from fruit on thawing and in improving the appearance of the fruit. The characteristics of the pectinates did not seem to exert a great deal of influence on their action. Different samples of pectinates covering a wide range in ester content worked equally well, whether acid- or enzyme-demethylated, of high or low gel power, or of high or low calcium optimum. No correlation could be found between these properties and the action of the pectinate on the frozen fruit; hence it is impossible to predict the action of a given pectinate on frozen fruit without an actual trial. A pectinate which gives poor results for another purpose may be satisfactory as an agent in the freezing of fruits.

A reduction in the amount of juice lost on thawing is a definite advantage, especially in the baking trade, where the fruit is put up in large containers and the juice cannot be used for baking purposes.

In addition, the presence of the pectinate in the fruit makes possible the direct preparation of jellied products for desserts and for other purposes. The short heating period required gives these jellied products a better flavor than that of the ordinary pectin jelly products.

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Products Journal, vol. 22, No. 4, p. 103, 1942.
7. C. W. Kaufman, E. R. Fehlberg and A. G. Olsen, *Food Industries*, vol. 14, No. 12, p. 57, 1942.
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Food Distribution Costs

(*Continued from page 86*)

He normally may receive no more than 10 to 50 percent of the prices at which fresh fruits and vegetables reach the consumer's table, the balance of the consumer price being absorbed by transportation, distribution costs and profits. The situation respecting canned and otherwise processed farm products is similar. The farmer's share is small, and the bulk of the price paid by consumers is absorbed by transportation, processor and distributor costs and profits.

The system of food distribution, in the United States, especially for fresh fruit and vegetables, has become complex, and, in some instances, over-extended. When supplies are plentiful and competition reasonably active, middlemen's profits may not add seriously to the total burden of distributions costs. But, under conditions of a seller's market, such as has been created by the present wartime demand and limitation of civilian supply, any such inflatoin of cost becomes a matter of grave public concern, because it tends directly and powerfully toward price inflation in the most basic of all consumer necessities. Moreover, in such times, commodities, if permitted, will pass through several distributors, each taking a full margin, particularly when close financial or other relationships exist among a pyramided chain of middlemen. For example, early in World War I, this Commission developed cases where through the pyramiding of middlemen's charges the customary wholesaler's margin of not to exceed 25 cents per ton for anthracite coal was increased to as much as five and six dollars per ton.

Inflation of consumer price may occur either by the interposition of more middlemen than are necessary, each taking his customary margin, or by the necessary number of middlemen, each taking a specified or customary percentage margin based either on the cost or selling price of the commodity. Where percentage margins are used, in an advancing market, it is possible that total distributors' spreads, in dollars and cents, may be doubled, or even multiplied several times, without any increase in the percentage markups. The introduction of more middlemen than are necessary accelerates the pyramiding of distrib-

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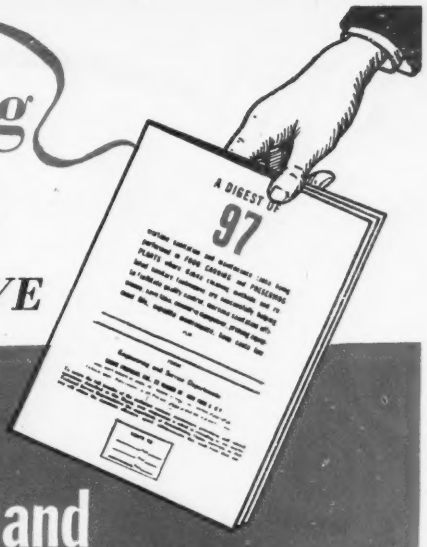

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utor margins to the point where their total becomes an unbearable burden to the consumer whose inability, or refusal, to buy, dams up distribution to the point where producer realizations actually may be decreased, and the entire purpose of distribution is defeated.

Oil of Marjoram

(*Continued from page 99*)

Specific gravity at 15°C...	0.892 to 0.908
Optical rotation.....	+ 14°2′ to + 23°58′
Refractive index at 20°C...	1.4700 to 1.4738
Saponification value.....	32.7 to 40.1
Acid value.....	1.4 to 2.8
Ester value after acetylation.....	81.2 to 86.8
Solubility.....	Soluble in 1 to 2 volumes and more of 80% alcohol
Color.....	Pale yellow

This oil was treated with potassium hydroxide test solution, and less than 1 percent was found to be soluble. This alkali-soluble material was tested for phenols, both by odor and by the ferric chloride test, and found to contain no phenols.

According to Gildemeister and Hoffmann,[3] the constants of sweet marjoram oil vary between the following limits:

Specific gravity at 15°C...	0.894 to 0.910
Optical rotation.....	+ 15° to + 25°
Refractive index at 20°C..	1.470 to 1.476
Acid value.....	Up to 1.5
Ester value.....	10 to 38
Ester value after acetylation.....	41 to 78
Solubility.....	Soluble in 1 to 2 volumes and more of 80% alcohol

Chemical Composition of Sweet Marjoram Oil—The investigation of Beilstein and Wiegand[7] did not give a sufficiently clear picture of the chemistry of marjoram oil. Biltz[8] and later Wallach[9] identified the following compounds:

terpinene.....	According to Biltz,[8] oil of marjoram contains about 40 percent terpenes, mainly terpinene.
d-α-terpineol.....	In the fraction boiling between 215 to 218 deg. C., atmospheric pressure.
terpinenol—4 (Δ^1 menthenol—4)	According to Wallach,[9] terpineol as contained in marjoram oil consists mainly of an isomere, viz., the active terpinenol 4. The alcohols occur in marjoram oil mainly in the free state and only to a small extent as esters.

Oil of Spanish Wild Marjoram

As pointed out in the introduction, *Thymus mastichina* L., the Spanish "forest marjoram," *mejorana silvestre* or *tomillo blanco*, grows wild as a perennial on the sunny hillsides of southern Spain. The plants are cut during the flowering period and distilled in migratory direct-fire stills in much the same manner as rosemary, spike lavender, thyme and other Spanish essential oils. (In a previous paper,[4] the writer described production

of Spanish essential oils.) Considerable quantities have reached the American market in past years.

Physico-chemical Constants of Spanish Wild Marjoram Oil—Shipments of genuine Spanish wild marjoram oils received by us during the last few years and analyzed in our New York laboratories varied between the following limits:

Specific gravity at 15°C...	0.914 to 0.922
Optical rotation.....	+0°42′ to +10°41′
Refractive index at 20°C..	1.4630 to 1.4661
Saponification value.....	4.7 to 13.1
Ester value after acetylation.....	46.7 to 81.2
Cineol content.....	63.2 to 65.0
Color.....	Pale yellow

In regard to physico-chemical constants of this oil, see also the investigations of Dorronsoro as reported in Schimmel's Berichte[5] and by Gildemeister and Hoffmann.[6]

Chemical Composition of Spanish Wild Marjoram Oil (Thymus mastichina)—The chemical composition of the Spanish oil is entirely different from that of sweet or garden marjoram. It contains a large amount of cineol or eucalyptol, which is the main odor carrier. Dorronsoro[5] identified the following compounds:

cineol.....	It is the main constituent. The oil contains from 64 to 72 percent of cineol.
d-a-pinene.....	Seven to 8 percent pinene is present. (B.P. 168 deg. C. at 710-mm. pressure.)
a phenol.....	Less than 0.1 percent. It does not crystallize, neither does it give a positive color reaction with ferric chloride.
l-linalool.....	In the fraction B.P. 185 deg. to 195 deg. C.
acetic acid and *isovaleric acid*...	Present in free and ester form.

Employment

Oil of marjoram, like the dried herb, is one of the most useful flavoring agents for seasoning spice bouquets, sausages, canned meats, soups and other food products. Over the dried herb, it has the advantages of highest possible flavor concentration and greater uniformity. Oil of sweet marjoram possesses a much finer, more characteristic aroma and flavor than the Spanish oil, which has a decided cineol- or eucalyptus-like odor. The Spanish oil, however, is considerably lower priced.

References

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2. Condiment Plants, The U. S. Department of Agriculture, Bureau of Plant Industry, July, 1941.
3. *Die Atherischen Ole*, 3d Ed., Vol. III, p. 737.
4. Spanish Essential Oils, *American Perfumer*, May and July, 1929.
5. Ber. Schimmel & Co., April 1911, 118; 1921, 87.
6. *Die Atherischen Ole*, 3d Ed., Vol. III, p. 770.
7. Ber. d. Deut. Chem. Ges. 15 (1882), 2854.
8. Inaugural Dissertation, Greifswald 1898—Ber. d. Deut. Chem. Ges. 32 (1899), 995.
9. Liebigs Ann. 350 (1906), 169;–356 (1907), 206.

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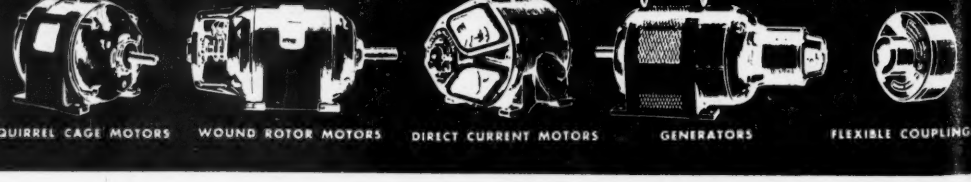

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CATALOGS & BULLETINS

FOOD PLANT EQUIPMENT

Air Conditioning—Agitair air conditioning units and heating and ventilating equipment, such as air diffusers, heavy-duty ranges, bake ovens and stoves, air exhausters and air filters, are briefly described and illustrated in a 10-page booklet put out by Air Devices. Inc., 17 E. 42nd St., New York 17.

Refrigeration and Air Conditioning—New and additional applications of refrigeration and air conditioning in World War II to help in the production, processing and distribution of food products overseas and in war plants, are described and illustrated in a 32-page catalog, "Refrigeration and Air Conditioning in War, in Peace," issued by Air Conditioning and Refrigerating Machinery Association, Southern Bldg., Washington, D. C.

Unit Substations—"Packaging Pays Off," is the title of 16-page illustrated bulletin, B-6285, describing standardized, load center, unit substations of from 100 to 2,000-kva. capacity for meeting the power supply needs of all types of industries; issued by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Vacuum Filters and Dryers—Descriptions, specifications and photographs illustrating many applications of continuous vacuum filters and other types of filters in food processing and similar industries are given in a 48-page catalog issued by Eimco Corp., Salt Lake City, Utah.

Vibrating Screens—Designed for the purpose of separating solids from liquids in food industries and similar fields, drawings and photographs illustrating Robins vibrating screens, as well as dimension tables for this equipment, are found in Bulletin 123 issued by Robins Conveying Belt Co., Passaic, N. J.

PLANT SUPPLIES

Ball Bearings—Correct methods for handling bearings when overhauling equipment, including dismounting, cleaning and remounting procedures, are simply described and illustrated in 14-page Booklet ND-A57, entitled "Service Procedure for Ball Bearings," published by New Departure Division, General Motors Corp., Bristol, Conn.

Bearings—Stock list No. 2, a 16-page bulletin listing dimensions and prices of sleeve, flanged and self-aligning type bearings, thrust washers and solid plugs, and describing the chemical and physical properties, application data and detailed installation methods of "Compo" oil-retaining porous bronze bearings, has been published by Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.

Belt Drives—The automatic belt-tension control feature of V-belt and flat-belt drives is explained, and selection tables, specifications and installation instructions are given in a 70-page handbook put out by Department 121, American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

Packings—Application data for self-lubricating packings, available in square braided form in all sizes for rods and shafts and in twisted form for valve stems, is given in chart form in a 4-page booklet published by Greene, Tweed & Co., Bronx Blvd. at 238th St., New York 66.

Paints—Application suggestions, technical data, fully illustrating the use of Valdura heavy-duty industrial maintenance paints are given in a catalog published by American-Marietta Co., 43 E. Ohio St., Chicago 11.

Pumps—Construction features and principles of operation of Rex Speed Prime pumps with a capacity range of from 3,000 to 125,000 gal. per hour, also specifications and capacity charts, are given in Bulletin 433 by Chain Belt Co., 1600 W. Bruce St., Milwaukee, Wis.

Pumps—Dimensional diagrams and charts for "Monobloc" centrifugal pumps with steam turbine drive for use in breweries, air conditioning, refrigeration and other industrial plants are given in Bulletin W-321-B13B, issued by Worthington Pump & Machinery Corp., Harrison, N. J.

CONTROL EQUIPMENT

Flow Meters—"Flow Meter Engineering," a 16-page reprint of an article by William C. Bennett, covers the use of flow meters and instruments in modern plants, as well as basic metering data and drawings of various installations published by Cochrane Corp., 17th & Allegheny Ave., Philadelphia 32, Pa.

Pyrometers—Bulletin P1211, a pyrometer accessory manual giving engineering data on the selection and installation of thermocouples, protection wells and lead wire, has been issued by Bristol Co., Waterbury 91, Conn.

Recording Thermometers—Installation details, specifications, and uses of recording thermometers in frozen food locker plants, are described and illustrated on a data sheet published by Bristol Co., Waterbury 91, Conn.

PACKAGING

Adhesives—For permanently attaching paper labels to metallic and nonmetallic surfaces and for sealing waterproof export bags, envelopes and solid fiber boxes with water-resistant glues No. 3020-P and 2007, three short pamphlets, Bulletins 4, 5 and 6, respectively, have been put out by Paisley Products, Inc., 1770 Canalport Ave., Chicago 16.

Packaging—Used to replace metal in the packaging of products, paperboard, fiber and corrugated containers of either cylindrical or rectangular construction with a cellophane pouch are illustrated in an 8-page booklet put out by Millprint, Inc., Florida 5th & Virginia Sts., Milwaukee 1, Wis.

MISCELLANEOUS

Floor Repairs—A material for repairing and resurfacing holes, ruts, breaks and irregularities in industrial concrete floors—Agapatch concrete floor patch—which is impervious to acids, strong alkalies, oils and greases, is described in a brief booklet put out by Agatex Corp., 1170 Broadway, New York 1.

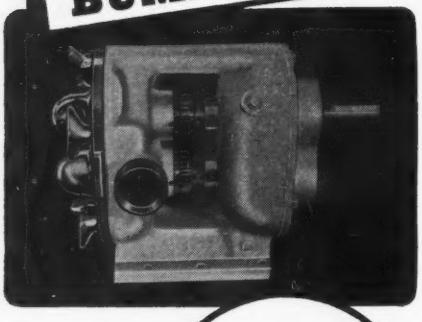
Fumigation—"Military Fumigation Manual," a 50-page booklet written for officers and civilians in the armed forces in charge of vermin control, discusses in detail, Zyklon Discoids for fumigating military buildings and Cyanogas Calcium Cyanide to control rats and other pests; published by American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York.

Maintenance—The first issue of a bimonthly entitled "Operation and Maintenance Review," containing wartime maintenance tips and timely articles on current maintenance trends, has been issued by Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis.

Marketing Technics—A 30-page booklet entitled "Modern Methods of Egg and Poultry Marketing," describing many improved methods of getting high quality poultry and poultry products to the consumer as quickly and as cheaply as possible, has been published by E. I. du Pont de Nemours & Co., Inc., Organic Chemicals Department, Wilmington 98, Del.

Metal Spinning—Over 100 pictures, illustrating how metal spinning is done, the adaptability of metals to the spinning process and numerous uses of metal spinning in industry, are shown in the 40-page catalog, "A Guide to the Use of Metal Spinning in all Industries," issued by Milwaukee Metal Spinning Co., 1325 S. 43rd St., Milwaukee 14, Wis.

WARTIME FOOD PROCESSING PLANTS *Appreciate this* BUMP PUMP



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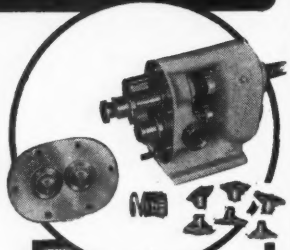

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The food processing plants who are fortunate to have Bump Pumps now in operation appreciate their volume, as Bump Pumps enable them to continue with uninterrupted production during these critical times.

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BOOKS

Data on Lighting

LIGHTING HANDBOOK. Published by Westinghouse Lamp Division, Westinghouse Electric & Manufacturing Co., Bloomfield, N. J., 1943. 175 pages; 5x7½ in.; cloth. Price $1.

Food plant managers in many cases could well pay more enlightened attention to the illumination in their factories and offices. It long has been known that both the rate and the quality of production are improved by proper lighting. And in the food plant there is another function of good lighting—to make the plant look brighter and more sanitary so as to make a good impression on visitors.

So this little handbook, which packs into convenient and practical form a great amount of information about lighting, can be put to good use in the food industries.

The handbook deals with the practical aspects of illumination, not the artistic. Of particular value to men in the food industries are the chapters on eyesight conservation, modern light sources, recommended levels of illumination, interior wiring for lighting, industrial lighting and the cost of lighting. While not intended as a complete treatise on the subject, the book gives enough data to enable the plant man to judge the adequacy of present illumination or to determine what requirements should be met in a new installation.

Facts of Food Poisoning

FOOD POISONING. By Elliot B. Dewberry. Published by Leonard Hill, Ltd. 17 Stratford Place, London, W. I., 1943. 186 pages, 9x6 in.; cloth. Price, 14 shillings.

Discussed as early as the ancient writings of Hippocrates, food poisonings through the ages has received much attention in the literature, but too often by uninformed writers or deliberate quacks out to capitalize a subject of popular interest. And only in comparatively recent years has the true nature of so-called food poisoning been properly analyzed technologically and preventive measures developed.

This book is a compilation of the fundamental facts known, and it has value to food manufacturers who not only must prevent poisoning from commercially prepared products but occasionally must defend themselves against unjust damage claims from consumers. This volume explains the nature of the different types of food poisoning, gives their history and outlines measures for prevention and control. It is devoted to bacterial food poisoning (including botulism); contamination of food by metals; plants and fungi; fish and shellfish; and contamination of food by poisonous gases used in war. Attention is also paid to food allergies.

Cake Baking Technology

CAKE MANUFACTURE. By Edmund B. Bennion and James Stewart. Published by Leonard Hill, Ltd., 17 Stratford Place, London, W. 1, England, 1943. 264 pages 5½x9 in.; cloth.

Though published in England, this book is of just about as much value to American food men as to those in the British food industry. This is true because it is not a book of formulas. Better, it is a volume designed to give the reader a good working knowledge of the materials and the processes employed in cake making. Since emphasis is placed upon the necessity for producing cakes of a high degree of quality and uniformity, special attention is devoted to the methols used for evaluating raw materials and for the technical control of processes. Summaries of standard recipes are included in the book as a guide.

Now in its second edition, the book contains new chapters on chocolate, jams and jellies, the development of high-ratio cakes and wartime confectionery problems.

The author's technic in getting at fundamentals can be indicated by taking as an example the chapter on eggs and their uses. This chapter discusses sources of supply, the functions of eggs, egg shells, whites of eggs, egg yolks, preservation of eggs, uses of eggs, frozen eggs, defrosting eggs, sugar preserved eggs, dried or desiccated eggs, dried albumen, sponge products with dried eggs and egg substitutes.

The Sugar Industry

MANUAL OF SUGAR COMPANIES, 1943. Published by Farr & Co., 90 Wall St., New York, N. Y. 221 pages, 5x8 in.; paper. Price $1.

Now in its twenty-first edition, this manual is the most complete collection of up-to-date facts about the sugar industry which is available. It contains full-page descriptions of important sugar producing and refining companies and the synopses of miscellaneout sugar concerns Then there are statistics on production, yields, prices, consumption, and so forth. Among the special subjects treated in this edition are sugar control, sugar quotas of 1942,

ceiling prices and rationing. There also are historical and descriptive sketches of the beet sugar industry in the United States and of the cane sugar industries of Louisiana, Puerto Rico and the Dominican Republic.

Letters to the Editor

Poetry With a Point

EDITOR'S NOTE—*Communications to The Editor customarily come in the form of letters, but here's one done in poetry. Because it makes its point so poignantly and because you are likely to enjoy it, "Food Industries" is setting what may be a dangerous precedent by putting poetry into its pages. Anyway, it shows what wartime stress can do to a food technologist.*

"NUTRITION"

Of all the sciences which have been
developed by men of learning
and great erudition
None in its present state is quite as
half-baked as the science of
Nutrition.
And of all scientists, probably by far the
least efficientest
Is the lady nutritionist.

They go around talking about nutritious
food
And if food is not nutritious, then for
what the hell is it good?
In Washington you find them Southeast,
Southwest, Northwest and
Northeast.
You find them in the Army, in the Navy,
in the War Food Administration,
not to say Lend-Least.

They go around stuffing our armed
forces with cabbage, carrots
and spinach.
Is it any wonder that our boys are so mad
that they are determined to
battle the Axis to a finach?
They are determined to improve the
standard of diet of the Greek,
the Slovak and the Bulgarian,
But object to feeding them bread, bean
soup and other food so crudely
vulgarian.

Even though you try to sell them pea soup
full of proteins, carbohydrates
and other elements conducive
to chest hairiness,
They insist that it have a dainty aroma and
a pale green color suggestive of
airy fairyness.
So I say, let us keep the seven-year itch,
the New Deal and even the
prohibitionists,
But for Heaven's sake, deliver us from this
plague of lady nutritionists.

Anonymous.

HIT-OR-MISS answers won't do—success comes with the *right* answers!

That's where Wyandotte can help you—with a *full* line of cleaning products . . . compounds to work in water of any hardness . . . cleaners that pack a Sunday punch for soil, scale deposits, food encrustations, bacteria and odors.

Whether your business is food packing or processing, dehydrating, debulking or quick freezing, there's a Wyandotte Product for *any* cleaning job you face . . . be it washing milk cans and bottles, or cleaning great vats and tanks.

And just as Wyandotte Cleaning Products are *specialized* to fit the job at hand, so is the Wyandotte Representative a *specialist.* He's ready at all times to tell you *what* to use for *which* job. Why not give him a call—*today?*

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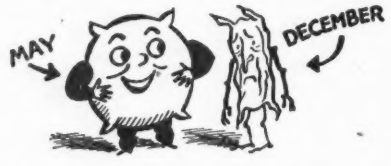
"Whad'ya Know, Brother, About BULK?"

EVERY TECHNICAL man is supposed to know his own field thoroughly and have a general idea of related technical fields. But few food processors have time to develop more than a sketchy knowledge of these related subjects.



Take the bulkiness of salt—the specific gravity—which may vary rather widely. A survey of various salt products from different sections of the country has shown that even salt of the same grade can vary up to 25% in bulkiness over a period of months.

Diamond Crystal processing engineers have eliminated this variation to a considerable extent through rigid control of crystallizing conditions and the most modern screening methods. Thus the various grades of Diamond Crystal Salt will not vary more than 4% plus or minus—usually not over 2%.

If you, as a food processor, are applying salt by volume—through a hopper, for example, as in salting soda crackers, potato chips, and similar products—you can only achieve flavor control by using a salt that varies but slightly in bulkiness. Why not check the density of each shipment of salt you are using and see how much it varies in bulk?

NEED HELP? HERE IT IS!

If this is the solution to that variable-flavor problem, write our Director of Technical Service. He will be glad to help you find a cure. Diamond Crystal, Dept. J-4, St. Clair, Michigan.

DIAMOND CRYSTAL
ALBERGER PROCESS **SALT**

PATENTS

Foods With Fibrous Cell Structure Frozen Prior to Dehydration in Current of Gas at Below Scalding Temperature for Retention of Color and Flavor Components—Melville E. Dunkley, Vernalis, Calif. No. 2,333,850. Nov. 9, 1943.

Fruit and Vegetable Juices Packaged in Container Whose Head Space is Swept Free of Air by Small Bubble-producing Inert Gas—Arthur E. Stevenson and John M. Boyd, Chicago, Ill., to Continental Can Co., Inc., New York, N. Y. No. 2,333,898. Nov. 9, 1943.

Yeast Growth Promoted by Addition of Factor II_B Into Wort Containing Carbamide—Alfred S. Schultz and Lawrence Atkin, Bronx, and Charles N. Frey, Scarsdale, N. Y., to Standard Brands, Inc., New York, N. Y. No. 2,333,955. Nov. 9, 1943.

Yeast Growth Promoted by Addition of Inositol, Beta Alanine, II_B, 2-Methyl-5-Ethoxy Methyl-6-Amino Pyrimidine and 4-Methyl-5-B-Hydroxy Ethyl Thiazole to Wort—Alfred S. Schultz and Lawrence Atkin, Bronx, and Charles N. Frey, Scarsdale, N. Y., to Standard Brands, Inc., New York, N. Y. No. 2,333,956. Nov. 9, 1943.

Single Sticks of Chewing Gum Moving in Lengthwise Direction Wrapped by Mechanical Means—Willet B. Ranney, Chicago, Ill., and Albert F. Runf, Cos Cob, Conn., to William Wrigley, Jr., Co., Chicago, Ill. No. 2,334,029 and 2,334,030. Nov. 9, 1943.

Dried Foods Precooked in Atmosphere of Steam Preliminary to Simultaneous Drying and Grinding While in Moist State—Hans F. Bauer and Elmer F. Glabe, to Stein Hall Mfg. Co., Chicago, Ill. No. 2,334,059. Nov. 9, 1943.

Liquid Extracts Made by Preliminary Use of Moisture-absorbing Inert Substance to Permit Free Expansion of Material to be Extracted and Speed Up Operations—Clinton W. Carter, Allison Park, Pa. No. 2,334,171. Nov. 16, 1943.

Edible Jelly Made From Composition Containing Soluble Pectin and Edible Salt of Calcium or Magnesium With Other Ingredients—Aksel G. Olsen, Summit, and Ellis R. Fehlberg, Rutherford, N. J., to General Foods Corp., New York, N. Y. No. 2,334,281. Nov. 16, 1943.

Milk Heat Treated in Continuous Manner in Single Unit That Permits Raising to Temperature Above Boiling Yet Discharging at Approximately Same Temperature Milk Had Before Entering Unit—William T. Crighton, to Producers Creamery Co., Springfield, Mo. No. 2,334,317. Nov. 16, 1943.

Granular Water-soluble Food Material in Dry State Ground With Lecithin to Give Uniform Distribution Throughout Mass.—William J. Fitzpatrick, Chicago, Ill., and Harold H. Wagner, Cincinnati, Ohio, to W. J. Fitzpatrick Co., Chicago, Ill. No. 2,334,401. Nov. 16, 1943.

Solution of Dry Casein in Water Aided by Addition of Neutral Soluble Salts of Phthalic Acid Substituted Derivatives—Edward F. Christopher, to Industrial Patents Corp., Chicago, Ill. No. 2,334,607. Nov. 16, 1943.

Frozen Confections Contained in Ice Cream Cones Given Topping By Mechanical Dipping of Multiple Units in Melted Coated—Frank Sportolari, Pittsburgh, Pa. No. 2,334,654. Nov. 16, 1943.

Rice Precooked and Canned to Give Light Colored, Non-gritty, and Non-pasty Finished Product—Milton Yonan-Malek, San Francisco, Calif. No. 2,334,665. Nov. 16, 1943.

Ground Meat and Like Compressed Into Predetermined Shape to Fit Interior of Container—Isaac N. Jordan, to Armour and Co., Chicago, Ill. No. 2,334,774. Nov. 23, 1943.

Juices Pressed From Citrus Fruits by Mechanical Means Without Inclusion of Peel Oil—Ronald B. McKinnis, to McKinnis Foods, Winter Haven, Fla. No. 2,334,783. Nov. 23, 1943.

Butter Made in Combination Churn and Worker With Rotatable Barrel Fitted With Plurality of Paddle-like Baffles Extending Lengthwise of Barrel—Joseph H. Godfrey, Elmhurst, to Creamery Package Mfg. Co., Chicago, Ill. No. 2,334,919. Nov. 23, 1943.

Dehydrater Made to Have Closed Furnace Chamber and Means to Direct Combustion Gases Into Drying Chamber Under Controlled Conditions—Wilburn W. O'Neal and Robert D. Williams, Memphis, Tenn., to Wilburn W. O'Neal. No. 2,334,949. Nov. 23, 1943.

Amino Acids Hydrolyzed From Their Anhydrides With Use of Oxidation-reduction Potential Stabilizer Agent—Frederick C. Bersworth, Verona, N. J., to Martin Dennis Co., Newark, N. J. No. 2,334,986. Nov. 23, 1943.

Amino Acid Anhydride Content of Naturally Occurring Materials Converted Into Substituted Amino Compounds With Aid of Oxidation-reduction Stabilizing Agent—Frederick C. Bersworth, Verona, N. J., to Martin Dennis Co., Newark, N. J. No. 2,334,987. Nov. 23, 1943.

Coated Confections Transferred From Coating Machine Conveyor to Endless Belt Conveyor Into Cooling Tunnel by Means of Parallel Supporting Rails Functioning as Shaking Table—Edward E. Cahoon, Racine, Wis. No. 2,335,043. Nov. 23, 1943.

Vinegar Made From Alcohol in Continuous Manner—Michael Paul Kedrovich, Elmhurst, Long Island, N. Y. No. 2,335,065. Nov. 23, 1943.

Vacuum Pan Designed to Have Longitudinally Extending Rotating Heater Element Divided Transversely Into Separate Hollow Spiral Sections—Jacob J. Neuman,

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South Salem, N. Y. No. 2,335,131. Nov. 23, 1943.

Fruits, Vegetables and Like Graded for Size by Mechanical Means—Edwin M. Wayland, Covesville, and James Raymond Drummond, to Clancy S. Ralston and J. Raymond Drummond, Onley, Va. No. 2,335,164. Nov. 23, 1943.

Skimmed Milk Containing Vegetable Oil Agitated During Evaporation Under Approximately 26-in. Vacuum With Introduction of Vitamin A and D Concentrates—Charles G. Hauser, Henry Otto Bierbaum and Harry J. Miller, to Carolene Products Co., Litchfield, Ill. No. 2,335,275. Nov. 30, 1943.

Whey Dried in Paddle-equipped beater in Air Atmosphere After Concentrating Under Vacuum to Supersaturation With Respect to Lactose—Kurt Bertram, Berlin-Karolinenhof, and Erich Lemmerich, Mulheim-Ruhr, Germany, to Alien Property Custodian. No. 2,335,380. Nov. 30, 1943.

Pears Peeled by Mechanical Means—Albert R. Thompson, Los Gatos, Calif., to Food Machinery Corp., San Jose, Calif. Nos. 2,335,619 and 2,335,120. Nov. 30, 1943.

String Beans Graded by Mechanical Means—Joe Richard Urschel, Valparaiso, Ind., and William de Back, Niagara Falls, N. Y., to Chisholm-Ryder Co., Inc., Niagara Falls, N. Y. No. 2,335,891. Dec. 7, 1943.

Poultry Electrocuted Preparatory to Dressing—Abraham D. Bland and Glen F. Houdersheldt, Sioux City, Iowa. No. 2,335,993. Dec. 7, 1943.

Peaches Split and Pitted by Mechanical Means—Joseph Perrelli, El Cerrito, and Robert H. Smille, Albany, Calif. No. 2,336,123. Dec. 7, 1943.

Fruit and Vegetables Loaded for Shipment Precooled by Air Stream Moving Through Closed Circuit and Carrying Water Particles—Andrew Y. Preble, El Centro, Calif. No. 2,336,125. Dec. 7, 1943.

Cocoa Powder With 2 Percent Butter Fat Content Mixed With Fine Granulated Sugar and Heated Water Preparatory to Cooling to Form Crumbling Mass of Small Discrete Particles—Carter F. Jones and Walter Tresper Clarke, Brooklyn, and Benjamin J. Zenlea, Ozone Park, N. Y., to Rockwood & Co., Brooklyn, N. Y. No. 2,336,254. Dec. 7, 1943.

Lettuce Heads Packed for Shipment or Storage Treated with Antioxidant to Inhibit Discoloration and Deterioration—Irvine L. Phillips, Long Beach, Calif., to Seal-Pack Corp., San Francisco, Calif. No. 2,336,291. Dec. 7, 1943.

Confections Tumbled in Rotating Horizontal Drum To Be Sugar Coated in Continuous Manner—Joseph G. Rubens and Robert Laster, Brooklyn, N. Y., to Joe Lowe Corp., New York, N. Y. No. 2,336,298. Dec. 7, 1943.

Cocoa Butter Pressed to Remove Low-melt Fraction and Recombined With Low-fat Cocoa Solids to Give Chocolate Liquor With Nonblooming and Nonsoftening Properties for Hot-weather Use—Fred S. Carver, Short Hills, N. J. No. 2,336,346. Dec. 7, 1943.

Canadian Patents

Oils and Fats Refined and Bleached by Generating Chlorine Dioxide and Inert Gas in Their Presence and Diffusing Through Them—Hugo J. Kauffmann, to Buffalo Electro-Chemical Co., Inc., Buffalo, N. Y. No. 416,867. Dec. 7, 1943.

Eggs Mechanically Cleaned in Machine Equipped With Revolving Brush—Conrad J. Morgan, National City, Calif. No. 416,938. Dec. 14, 1943.

Whey Concentrated to Viscous State on Heated Metal Roll Without Crystal Formation Preliminary to Further Drying on Heated Roll Seeded With Crystalline Beta Lactose—Charles O. Lavett, to Buffalo Foundry & Machine Co., Buffalo, N. Y. No. 417,016. Dec. 14, 1943.

Corn Dried During Controlled Movement Through Blast of Hot Air—Jacob P. Riediger, Morden, Man., Canada. No. 417,333. Dec. 28, 1943.

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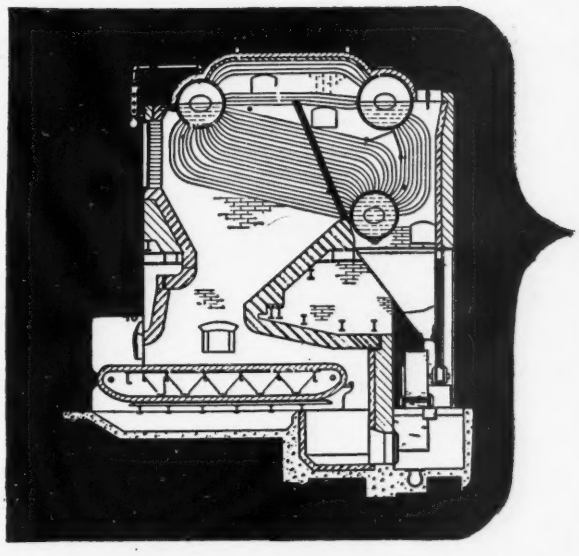

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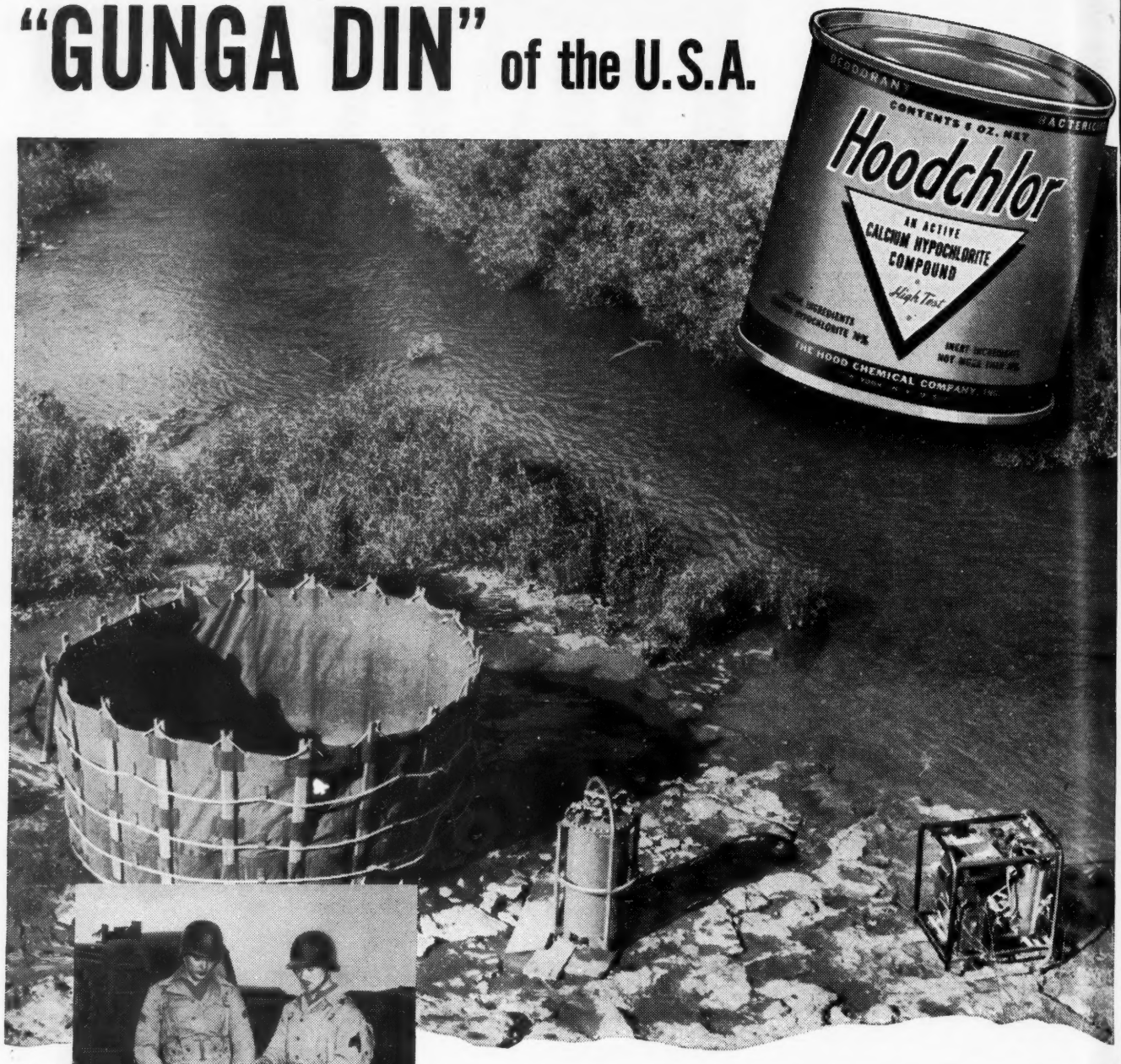

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FOOD TECHNOLOGY

NEW DISCOVERIES AND INVENTIONS

DAIRY PRODUCTS

Cool Milk to Insure Good Flavor in Cheese

MILK for Cheddar cheese should be subjected to as little agitation as possible, and all milk for cheese should be cooled. These definite conclusions are based on the grading of experimental cheeses made of first quality milk, under commercial conditions.

Rancid and unclean flavors were developed by agitating the milk. The authors state that vigorous agitation of uncooled milk, as in farm trucks on the way to the cheese station, activates the milk lipase and that it is lipase activity which accounts both for rancid flavor and for the related but less definite defect classed as "unclean flavor."

In general the higher the temperature of agitation in the range tested, 45 to 86 deg. F., or the longer the period of agitation, the lower the grade of cheese produced. Lowering the temperature, with an equal period of agitation, will prevent or minimize the flavor defect. There is some evidence that when lipase activity has been accelerated the quality of the cheese will decrease with age, but the storage period for these tests was not long enough to permit a positive conclusion.

Minimum agitation and cooling of the milk should be included in the definition of milk quality for cheese factories.

Digest from "Agitation and Temperature of Cheese Milk and the Development of Rancid and Unclean Flavors in Cheddar Cheese," by I. Hlynka, E. G. Hood and C. A. Gibson, *Journal of Dairy Science*, vol. 26, 1111-19, December, 1943.

SUGAR

Corn Sweeteners

DEXTROSE monohydrate in frozen ice cream, in the presence of cane sugar, has a sweetening value of 120 and anhydrous dextrose 125, compared to sucrose as 100. Corn sirup solids have an equivalent of 60 and the solids of enzyme-converted corn sirup, on an anhydrous basis, 75. Previously published values are considerably lower.

These figures were obtained by determining the amount of corn sweetener which must be added to bring a finished ice cream to the same sweetness as one otherwise the same but containing a known weight, 13 or 15 percent, of sucrose. Dextrose was substituted for one-third of the sucrose, corn sirup and enzyme-converted corn sirup for half the cane sugar. These are approximately the proportions used in practice. Mixtures of sugars show greater sweetening power than the sum of their individual sweetnesses would indicate.

This method was used because sweetness values determined in water solution, particularly in dilute solution, are not directly applicable to ice cream. Effective sweetening power increases in more concentrated solutions. Tests on the mix are not satisfactory because the effective sweetness is increased when the ice cream is frozen and the sugar is concentrated into that part of the water which is not converted into ice. The water present, rather than the total weight of the ice cream, determines the sweetening effect. In the experimental mixer the amount of water was kept the same.

Digest from "Sweetening Power of the Corn Sugars in Ice Cream," by A. Leighton and O. E. Williams, *Journal of Dairy Science*, vol. 26, 1107-10, December, 1943.

MEATS

Smoking Cured Meats

DESIRABLE effects through proper smoking of cured meat include improved keeping properties, flavor and appearance, increased tenderness and diminution of nitrite content. Smoking has a drying effect. It imparts a finish or gloss to the outside through formation of aldehyde-phenol condensed resins. The smoke supplies antioxidants to the fat and antiseptics and germicides to the meat.

Smoke and heat together destroy the microorganisms. The incubation range for mesophilic bacteria, 65 to 105 deg. F., must be passed through very quickly. Sweet pickle hams are smoked generally in the temperature range of 115 to 120 deg. F., inside temperature, but smoking may go as high as 137 deg. F. Thermophilic bacteria rarely cause trouble in the smokehouse operation, but occasionally grow in heavy bologna containing cereal or milk powder, if salt is not present in sufficient amounts or nitrate is not present in "permissible" amounts.

Temperature, not time, is considered an important factor for the destruction of nitrites. Nitrites in cured meats undergoing smoking or heating are destroyed both by reaction with the amino groups of the protein and by oxidation of the nitrous acid.

Digest from "Action of Hardwood Smoke on Bacteria in Cured Meats," by L. B. Jensen, *Food Research*, vol. 8, 377-87, September-October, 1943.

DEHYDRATION

Notes on Plant Practice

BRIEF notes on a number of operating situations in a dehydration plant are presented. Included are the suggestions that waste reduction, increased production, lower dehydration ratio and greater efficiency on the trimming line result from using the highest quality large size vegetables for dehydration. Solid content should be high.

Root crops for storage should be dry and as free from adhering dirt as possible to prevent bacterial spoilage. Storage in "pits" or in insulated houses is recommended, and long-time storage under refrigeration is not recommended for root vegetables because of moisture loss.

Darkening of stored potatoes during lye or flame peeling can be prevented by holding them at room temperature for at least three days, then heating in water at 163 deg. F. for 3 minutes before peeling. The author suggests that the treatment inactivates anabolic enzymes.

Digest from "Plant Problems in the Dehydration of Vegetables," by R. B. Tobin, 1943 *Proceedings, Institute of Food Technologists*, 58-69.

Low Melting Materials Can Be Spray Dried

APPARATUS for spray drying materials which when dehydrated form relatively low-melting-point solids, particularly those of the nature of corn sirup, has been patented.

Because of sticking and clogging in the dryer, it has not been possible to spray dry materials in which the melting point depends on the moisture and decreases with increase in water content. A certain dextrose mixture, for example, is sticky at 110 deg. F. with

5 percent water and only at 155 deg. F. with 2 percent water.

The newly designed equipment operates continuously at high capacity. Hot drying gas is introduced near the spray nozzles and also tangentially along the wall of the drying chamber at various levels, so as to create an extreme vortex effect and prevent deposition of the particles on the walls. In addition, the side walls are mechanically vibrated.

Liquid feed and drying air temperatures are regulated so that the walls are maintained at all times at a temperature below the softening point but above the dew point. The temperatures used are such that when the hot concentrated sirup is atomized into the drying chamber, flash evaporation chills the air immediately surrounding each particle below the softening point of the solid mixture. Relative humidity in the drying air streams at various levels is so controlled that after solidification the particle is always in a zone where the wet-bulb temperature is safely below the softening point of the solid mixture.

The product has a fine uniform particle size.

Digest from U. S. Patent 2,333,333, issued Nov. 2, 1943, to D. D. Peebles and P. D. V. Manning and assigned to Golden State Co., Ltd., San Francisco, Calif.

Dried Coffee Extract

LIQUID coffee extract, thoroughly filtered and partially defatted, is combined with colorless, odorless and tasteless carbohydrates and spray dried, according to a recent patent.

The success of the operation depends on the use of a percolator of sufficient length and roasted coffee of correct grain size so as to leave 85 percent of the coffee bean fat in the grounds. With the fat reduced, rancidity does not present a problem.

The extract is spray dried after adding the carbohydrates to "seal" the aromatic substances of the roasted coffee. It is preferred not to concentrate the extract, by vacuum or heat, since such concentration damages the aroma constituents.

Suitable carbohydrates are the product of acid hydrolysis of coffee grounds, or maltose or malto-dextrine mixtures obtained by malting such grounds. Maltose or glucose from other sources may be used.

Hot water under pressure at 266 deg. F. is used for percolation. The infusion is cooled to 40 deg. F., then the carbohydrates are added in such amount that their dry solids weight is about equal to the dry solids of the coffee.

It is recommended to add some previously dried particles or to freeze out some water from the liquid extract before spraying, as the resulting powder will be in coarser particles and more soluble.

Digest from U. S. Patent 2,333,027, issued Oct. 26, 1943, to M. R. Morganthaler and assigned to Inredeco, Inc., Panama City, Panama.

STORAGE

Damaged Grain

LARVAE of the Indian meal moth, *Plodia interpunctella* Hbn., feed only on the germ portion of the grain, which they destroy completely. Wheat which had been stored for two years undisturbed in an elevator annex and had become heavily infested in the surface layers was used for milling tests. Infected kernels and undamaged kernels were sorted by hand, for comparative tests.

The milling characteristics of the two portions were essentially the same, except for the lower yield of mill offals and higher flour yield to be expected in the degermed material.

Thiamine content was 1.61 micrograms per gram for flour from the undamaged grain and only 0.47 for the degermed material. This difference would be significant in a mill producing flour for enrichment.

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The baking characteristics were definitely poorer in all respects for the degermed wheat. Loaf volume was reduced almost 9 percent, crumb texture and color were inferior. It is suggested that the inferior baking quality is due to destruction of the germinating power. Swanson found that damage to baking quality from destruction of viability may be great, and that it increases with time. The quality of such wheat may be expected to decrease further with continued storage.

Digest from "A Note on the Damage to Wheat Caused by the Indian Meal Moth," by T. R. Aitken, *Cereal Chemistry*, vol. 20, 700–703, November, 1943.

Enzyme Deterioration In Infested Grain

CHEMICAL ABSTRACTS reports a Russian article which states that an enzyme preparation isolated from grain damaged by "wheat bugs" has a marked effect on dough gluten, similar to that of papain. Maximum activity is at pH 8. Activity is increased by cysteine and decreased by hydrogen peroxide. Potassium bromate and sodium sulphate have a depressing effect.

The dried preparation of the enzyme can be kept for months.

Digest from N. I. Proskuryakov and I. V. Bukharina, *Akademiya Markomsnaba S.S.S.R. Instituta Biokhimickeskoi, Biokhimiya Klebopecheniya Sbornik*, vol. 3, 85–104, 1942; through *Chemical Abstracts*, vol. 37, 5498. Sept. 20, 1943.

BACTERIOLOGY

Butyric Spoilage In Olive Brines

STRAINS of butyric acid producing anaerobes were isolated from Spanish type green olive brines which were undergoing abnormal fermentation and spoilage. Experimental cultures were grown to determine the conditions required to prevent growth of these undesirable bacteria.

Salt up to 5 percent was tolerated by a number of strains and 6 percent by one. This confirms the experience of the olive industry that 7 to 8 percent of salt in the brines of fermenting olives is required to prevent spoilage.

All 50 of the cultures grew and produced gas in media at pH 7.0, and almost all at pH 6.0 and 5.5. Only 17 cultures produced gas from glucose at pH 4.5 and none of these tolerated pH 4.3. Experience in the industry has shown that if fermentation is continued to pH 4.0, butyric spoilage is avoided.

Gas pockets occur in the olives when fermentation is of the type which pro-

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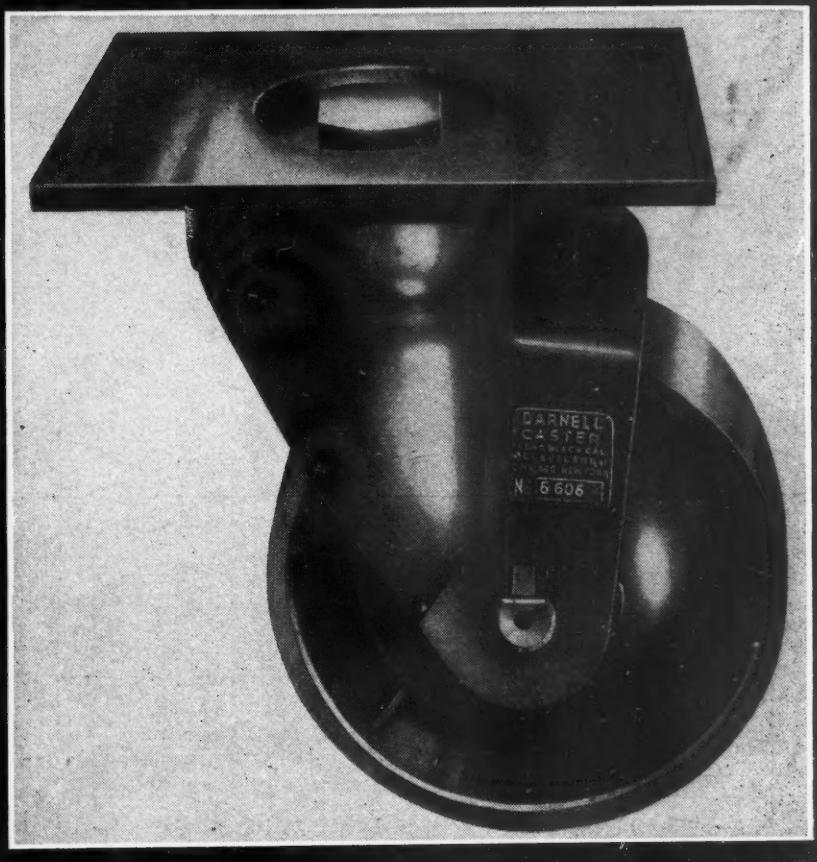

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duces hydrogen, as with the butyric anaerobes, but not when carbon dioxide is produced, as by lactic acid bacteria and yeasts.

Digest from "Characteristics of Butyric Acid Bacteria from Olives," by J. R. Gililland and R. H. Vaughn, *Journal of Bacteriology*, vol. 46, 315-22, October, 1943.

FATS AND OILS

Peanut Oil Fractions

TOCOPHEROL-RICH fractions distilling at 248 to 392 deg. F. were separated from hydrogenated and unhydrogenated peanut oil. Hydrogenation had no effect on the antioxygenic activities of the fractions.

When the tocopherol-rich fractions were added to higher boiling fractions almost free of antioxidants, the unhydrogenated oil increased in stability up to a maximum at about 0.025 percent tocopherol, then became increasingly less stable with further increases of tocopherol content. The hydrogenated oil increased in stability with added antioxidant up to the maximum value used, which was approximately 0.15 percent calculated as α-tocopherol.

The unhydrogenated oil corresponded to commercially prepared cooking oil, the hydrogenated oil to an all-hydrogenated shortening or margarine oil.

Digest from "Antioxygenic Properties of Molecularly Distilled Fractions of Peanut Oil," by A. E. Bailey, G. D. Oliver, W. S. Singleton and G. S. Fisher, *Oil & Soap*, vol. 20, 251-55, December, 1943.

Vitamin C Esters

ESTERIFICATION of l-ascorbic acid and d-isoascorbic acid with higher fatty acids yields monoesters which may be of interest as antioxidants and as emulsifiers. It is well known that both these ascorbic acids have interesting oxidation-reduction properties, but their insolubility in dry fat limits their usefulness as antioxidants. It is also suggested that a fat-soluble form of vitamin C may be of interest.

These possibilities are being investigated. The present paper deals with methods of preparation and the properties of the esters.

Concentrated sulphuric acid as a solvent and catalyst produced a good yield of the monoesters, in easily separable form. Treatment with a fatty acid chloride gave no separable product, and heating with the fatty acid and a catalyst yielded little if any of the desired esters.

Digest from "Fatty Acid Monoesters of l-Ascorbic Acid and d-Isoascorbic Acid," by D. Swern, A. J. Stirton, J. Turer and P. A. Wells, *Oil & Soap*, vol. 20, 224-26, November, 1943.

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Determining Citrus Solids

(*Continued from page 93*)

applicable to citrus juices and concentrates. Drying at this temperature, under vacuum, causes a partial decomposition of citric acid, and may also cause some degree of caramelization of sugars present and a breaking down of pectinous bodies. These changes involve a weight loss, so that the apparent total solids values are lower and constant weight in the samples cannot be achieved.

It is tentatively assumed that the loss in weight is largely occasioned by breaking down of citric acid proper. This decomposition has been definitely demonstrated. It will be obvious that the resulting error in total solids determination will be greatest in lemon and lime juices, in which citric acid rather than sugar constitutes most of the solids present.

Drying at 40 deg. C (104 deg. F.) has been found to entail no detectable decomposition of citric acid. This temperature enables arrival at constant weight in a short drying period and gives values for total solids much more closely approximating the true soluble solids values obtained by suitably correcting the spindle or refractometer readings. It is therefore suggested that the 40 deg. C. temperature be employed instead of the stipulated 70 deg. C. whenever the A.O.A.C. vacuum drying methods are employed in checking the total solids values against the true soluble solids values of the Stevens-Baier method.

The following meager preliminary data are presented for two reasons. First, they point out the error to be expected when 70-deg. C. drying is employed. Secondly, they serve as a basis for the suggestion that the rapid and convenient Stevens-Baier method be used and its results taken as approximating the total solids value, at least until further work justifies the adoption of some modification of the 40-deg. C. drying method proposed herewith.

It was noted during drying at 70 deg. C., on sand and at reduced pressure according to the A.O.A.C. method, employing a lemon juice concentrate of about 50 deg. Brix, that samples never actually came to constant weight and that 20 hours or more was required before the loss increment fell below the 2-mg. figure specified in the method. In contrast, it was observed that at 40 deg. C. the weight loss was practically complete at the end of the first two or three hours and that actual constant weight was attained in six to nine hours.

In Table I Brix spindle and true soluble solids values obtained by applying the Stevens-Baier corrections to refractometer sugar-scale readings are compared with total solids values obtained by the A.O.A.C. method but employing both 70-deg. C. and 40-deg. C. drying temperatures. Sample A represents a typical juice. Sample B was a 41-deg. Brix lemon juice concentrate which, by titration, showed a content of citric acid of 26.25 percent on an anhydrous basis. This was included because it shows the extent of the error due to citric acid decomposition and the verification of such decomposition.

TABLE I—Comparison of Solids Values by Various Methods.

	Sample A	Sample B
From refractometer reading:		
True soluble solids, %...	48.10	39.78
Brix spindle value, deg...	49.69	41.32
By A.O.A.C. vacuum drying method using sand:		
Drying at 70 deg. C., %..	46.11	37.85
Drying at 40 deg. C., %..	48.32	39.41

TABLE II—Comparison of Results by Refractometer and 40 deg. C. Drying

Sample No.	Percent true soluble solids by refractometer	Percent total solids by 40°C. drying method
1	48.01	48.32
2	39.78	39.41
3	39.64	38.70
4	19.41	19.05
Mean	36.71	36.37

Titration of a diluted duplicate of the original Sample B showed 26.25 percent citric acid content, on an anhydrous basis. Titration of the leached dried juice-sand mixture, after drying to near constant weight, showed only 24.56 percent citric acid when the drying had been at 70 deg. C., but 26.31 percent when the drying was done at 40 deg. C.

The approximate agreement between total solids values by the 40-deg. C. drying method and the true soluble solids values obtained by the refractometer method of Stevens and Baier for various concentrations of lemon juice is illustrated in Table II.

It is to be noted that the average agreement is fair and much closer than is possible when the drying temperature is 70 deg. C., although at best the average total solids value is a fraction of a percent lower than the average true soluble solids value, whereas the reverse condition should obtain. This discrepancy may be due to the effect on the refractometer readings of ash, invert sugar and possibly other constituents.

Recommendations

It is recommended that the refractometer method of Stevens and Baier be employed for its speed and accuracy, taking such true soluble solids values as approximating the total solids values to perhaps within about 0.5 point, and that a temperature of 40 deg. C., rather than 70 deg. C., be used whenever it is desired to check actual total solids by any one of the drying methods of the A.O.A.C.

A further study of low-temperature drying methods should be made with the view to the development of some modification which might justify adoption as an official method specifically for use on juice products of high citric acid to total solids ratio.

References

1. J. W. Stevens and W. E. Baier, *Industrial and Engineering Chemistry*, Analytical Edition, vol. 11, 447-9, 1939.
2. Association of Official Agricultural Chemists, "Methods of Analysis," 5th Edition, No. 5, p. 485, 1940.

Hows to Vent Retorts

(*Continued from page 83*)

pipes are more than a few feet in length, a larger size of pipe should be used beyond the valves because friction in the small pipes would reduce the venting efficiency. The venting capacity of the outlets should be proportionate to the size of the retort, so that the removal of air may be completed within a reasonably short time (see Fig. 8). The ⅛- or ¼-in. petcocks usually provided on retorts are not large enough to function as vents, but serve only as bleeders to prevent the accumulation of noncondensable gases that may be introduced with the steam.

Trays and Crates

Tests have shown that strap-iron or wire trays and crates are the most desirable, because their construction permits the free flow of steam in all directions among the cans, and thus the air may be swept out of the retort more effectively. Satisfactory strap-iron equipment is shown in Figs. 2, 3 and 4.

When a perforated crate or gondola (Figs. 5, 6 and 7) is used, the removal of air becomes more difficult, because it is possible for the cans to cover a great many of the holes in the bottom, thus preventing much of the steam from sweeping up through the load. This is indicated in Fig. 5. To allow for adequate steam circulation, a sheet-metal crate should have the bottom perforated with at least the equivalent of 1-in. holes on 1¾-in. centers. Crates with fewer holes than this are unsatisfactory, but may be used with good results by covering the bottoms with four-mesh or coarser wire screen, made with No. 13 to No. 16 gage, or preferably even heavier, wire. This will keep the cans from blocking the holes

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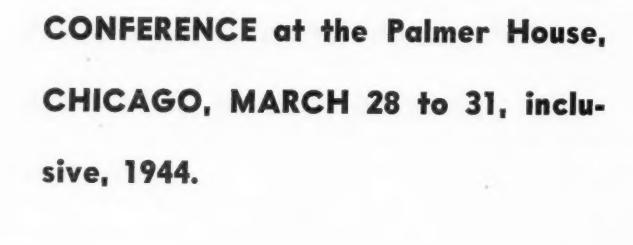

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and will permit some flow of steam around the cans and up through the load.

Arrangement of Cans in Baskets

There are three general methods of arranging cans in baskets; namely, vertical stacking (Figs. 2, 3, 4 and 5), horizontal stacking (Fig. 7), and jumble stacking (Fig. 6).

If adequately perforated single-layer trays (Figs. 2 and 3) are used, vertical stacking is satisfactory, because one tray is placed directly on top of the cans in the tray below it and the layers of cans are thus separated from each other by a space through which steam can flow readily. This method of stacking is suitable for use in horizontal retorts. When cans are stacked vertically in crates as in Fig. 5, however, long columns of cans frequently occur, with the result that heat is applied only to the sides of the cans instead of to all surfaces. In crates, vertical stacking is more satisfactory when the cans are staggered (Fig. 4). In vertical retorts, the top layer of cans in each crate should not project above the rim of the crate, because if a space is not left between each two crates, and the bottom of one rests directly on the cans in another, steam circulation is frequently considerably hindered and the cans are apt to suffer mechanical damage.

Horizontal stacking is frequently used in gondolas. In perforated equipment, this method allows for better heat distribution than vertical stacking, because the holes in the bottoms of the gondolas are not blocked off and steam travels readily up through the cans. It is not applicable to products such as asparagus and "asparagus style" string beans, which must be processed in a vertical position because convection currents within the can are greatly retarded by the units of food when the cans are in horizontal position, thus decreasing the rate of heat penetration and the effectiveness of the process.

Jumble stacking of cans allows for uniform and rapid steam circulation. However, it reduces the capacity to about four-fifths of that obtained when other stacking methods are used and a certain amount of can damage results.

Baffle Plates and Dividers

Perforated baffle plates should not be used in the bottoms of vertical retorts because they tend to direct the flow of steam around the load rather than up through it. This is especially true when perforated crates are used, because the holes in the plate and in the bottom crate frequently do not match and steam cannot readily penetrate up into the load.

Dividers of various types are sometimes used to separate cans of one lot

from those of another in the same crate. Such dividers should be made of material of sufficiently large mesh to permit adequate steam circulation. Fish net or onion sacks of ½-in. or larger mesh are satisfactory. Burlap sacks, boards or similar materials should not be used because they greatly interfere with steam circulation.

Steam Supply

The boiler capacity, steam header, steam supply lines and valves, and perforations in the steam distribution pipes should be sufficiently large to permit adequate venting without excessively long coming-up times. The steam inlet should be proportionate to the size of the retort. For 40-in. diameter, three-crate, vertical retorts, the steam inlet should be of at least 1-in. pipe size, and better operation is obtained when a larger size inlet is used. For horizontal retorts up to 12 ft. in length, the steam inlet should be at least 1¼-in. pipe size, and for longer retorts a 1½- or 2-in. inlet is preferable.

When the steam is not withdrawn from the lines fast enough, it may contain considerable moisture, which may affect the heat distribution in a retort. To prevent such a condition, it is suggested that a steam trap be installed or that the lines be bled frequently to obtain live steam.

Steam should enter the retort through a spreader in the bottom for the venting procedures described in this paper. The spreader pipe should have holes along the top so that steam is directed up into the load and not down against the shell. Unless the steam is jetted up, it tends to bypass the load and thus does not force the air out from among the cans.

According to Ecklund and Benjamin,* horizontal retorts should have about eight ¼-in. holes per foot of spreader pipe, and the spreader-pipe size should not be less than 1½ in. for spreader sections up to 9 ft. in length. For longer sections, a 2-in. spreader pipe is recommended. For vertical retorts the spreader pipe should be 1¼ or 1½ in., and a total of 50 to 60 ¼-in. holes is recommended. If ⅜-in. holes are used, about 80 percent more holes should be drilled in order to obtain equivalent flow for a given steam pressure.

Acknowledgment

The author acknowledges the assistance of the Research Laboratories of the American Can Co., Continental Can Co., and The Hooper Foundation for Medical Research, University of California, in carrying out this work.

Reference

* O. F. Ecklund and H. A. Benjamin, American Can. Co., Research Department, Maywood, Ill. Unpublished data (private communication).

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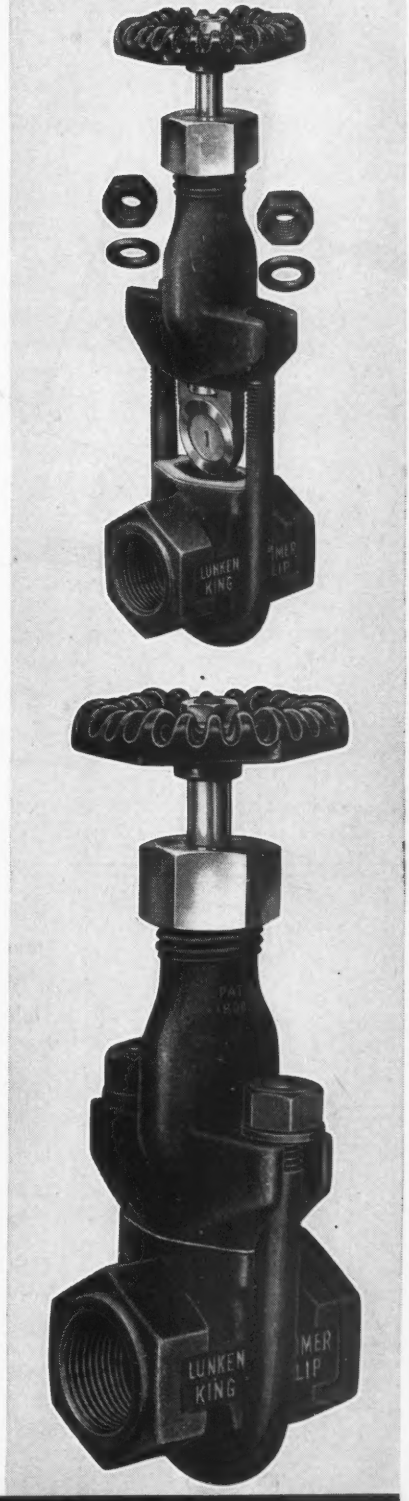

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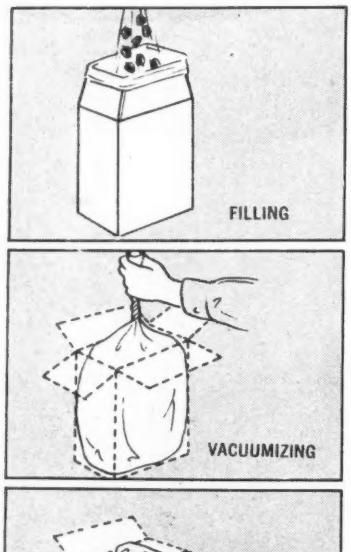

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FORMULAS FOR FOODS

FORMULA NO. 447

Tropical Lemon Pudding

Wheat flour	18 lb.
Corn flour	14 lb.
Water	10 gal.
Sugar	123 lb.
Corn sirup	48 lb.
Pectin powder	10½ oz.
Yellow color	as desired
Lemon juice	2 gal.
Whole eggs	12
Butter	8 lb.
Essence of lemon	5 fl. oz.
Glycerine	80 fl. oz.

Directions

Make the wheat and corn flours into a paste with 4 gal. of water and let stand overnight. Add the raw lemon juice to this mixture, stirring well, then add the mixture to the corn sirup and all but 3 lb. of the sugar dissolved in the remainder of the water.

Place in a steam kettle and heat, adding the 3-lb. of sugar, the pectin powder and the coloring, stirring all the time. Add butter, then eggs. Temperature should be 175 to 180 deg. F.

Raise the temperature to 212 deg. F. in 10 minutes and hold there for 4 minutes, then raise to 218 deg. F., and hold there for 10 minutes.

Using perfectly dry and sterile utensiles and containers, pass the mixture through a fine sieve, allow to cool to 190 deg. F., add the lemon essence and glycerine. Stir well and immediately fill into containers but allow the product to become cold before sealing.

This product should keep for as long as two years in good condition.

Formula from H. B. Cronshaw, Surrey, England.

FORMULA NO. 448

Chocolate Roll With Peppermint

Egg whites	1 lb.
Egg yolks	1 lb.
Sugar	1 lb. 12 oz.
Water	4 oz.
Cake flour	7 oz.
Cocoa	8 oz.
Baking powder	½ oz.
Salt	¼ oz.
Vanilla flavor	¾ oz.

Directions

Beat the egg whites until they point but not until dry. Fold in 14 oz. sugar. Beat the egg yolks and water until light, then add 14 oz. of sugar and beat until fluffy. Fold in the egg white and sugar mixture.

Sift together the dry ingredients several times and fold in. Add the vanilla last.

Bake at 400 deg. F. in sheet pans lined with paper. When baked, remove paper and roll up. Unroll when cold and fill with a soft creamy filling, such as Formula 405, to which peppermint flavor can be added as desired.

Formula from Pillsbury Flour Mills Co.

FORMULA NO. 449

Cured Pork Loaf

Cured pork meat	100 lb.
White pepper	6 oz.
Ground sage	¼ oz.
Ground cloves	¼ oz.
Mapleine	1 oz.
Water	13 lb.
Dry milk solids*	8 lb.

* Not over 1½ percent fat.

Directions

Run the cured pork through a ½-in. plate. Add 12 lb. of water, the dry milk solids and the seasonings, including the Mapleine dissolved in 1-lb. of water. Mix well.

Place the meat in frank, hoy or similar molds for cooking. Cook for 3½ hours at 165 deg. F. The inside temperature should be at least 154 deg. F.

After cooking, chill and remove from containers.

The loaf can be baked, if preferred, by placing meat in pans, smoothing top with sugar sirup and baking at 200 to 225 deg. F. until the inside temperature is 154 deg. F. Chill.

Wrap in Pliofilm or stuff in cellulose casing.

This loaf is intended to make practical and profitable use of sound meat from bruised or otherwise disfigured hams or shoulders. Meat should not be more than 20 to 25 percent fat, and must be cured.

Formula from American Dry Milk Institute.

FORMULA NO. 450

Special Icing

Powdered sugar*	9 lb. 6 oz.
Shortening	2 lb. 8 oz.
Special stock (see below)	3 lb. 2 oz.
Salt	1 oz.
Flavor	to taste
Cake flour	1 lb. 8 oz.

* Corn sugar may be used to the extent of 25 percent replacement of powdered sugar.

Directions

Cream one-third of the sugar (3 lb. 2 oz.) with the shortening until light. Add the special stock alternately with the balance of the sugar, salt and flavoring. Then add the cake flour. Whip until light.

Special Stock

Granulated sugar	2 lb. 8 oz.
Water	6 lb. 4 oz.
Cornstarch	8 oz.

Bring sugar to boil with 5 lb. of water.

Dissolve the cornstarch in 1 lb. 4 oz. of water, add to the sugar mixture and cook until clear. Use cold.

Variations

This icing will carry fruit. For a chocolate icing use 1 lb. of cocoa or chocolate and reduce the powdered sugar by a corresponding amount. Add the cocoa or chocolate when creaming the sugar and shortening.

Formula from Pillsbury Flour Mills Co.

FORMULA NO. 451

Orange Crumb Topping

Cake flour	1 lb.
Brown sugar	1 lb.
Cinnamon	¼ oz.
Salt	¼ oz.
Orange gratings	¾ oz.
Orange juice	3 oz.
Shortening	5 oz.

Directions

Mix together all the dry ingredients, add the orange juice and the melted shortening. Mix until crumbly.

Formula from General Mills.

FORMULA NO. 452

Pea Soup Cubes

Pea flour	80 lb.
Corn flour	40 lb.
Potato flour	40 lb.
Onion powder	12 lb.
Salt	18 lb.
Gelatine powder	12 lb.
White pepper	8 oz.
Beef extract	12 lb.

Directions

Place all the ingredients, except the beef extract, in a steam-heated kettle, fitted with a stirer. Heat and stir continuously.

Dissolve the beef extract in 5 lb. of boiling water and add very slowly, while continuing to heat and stir, until dry.

Press into cubes and wrap.

Formula from H. B. Cronshaw, Surrey, England.

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